THE ROLE OF PERSONALITY TYPE IN THE MANAGEMENT OF CHRONIC MUSCULOSKELETAL PAIN.

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Abstract

Chronic pain is a complex condition with a significant social and economic impact and a better understanding of the factors affecting improvement is required to inform best practice in the management process. Few studies have considered the effect of Weinberger et al.'s personality types in the management of pain. The four personality types are suggested to respond differently to threatening information such as pain, because of their attentional and interpretive biases. Using a variety of research methods, the global aim of this programme of research was to determine whether the management of chronic pain would be enhanced through the use of treatment stratified on the basis of personality type.

This thesis highlights important differences in the response to pain and pain management between the personality types, which are masked if the population is analysed homogenously. Defensive high-anxious individuals were more prevalent in the patient population compared to the asymptomatic control group and attended to pain related information more than the other groups. Defensive high-anxious individuals reported greater improvement for both pain and disability and showed stronger links between improvements in pain and disability and baseline psychological factors than the non-extreme individuals. The findings suggest that current treatments are more effective for defensive high-anxious patients. Furthermore, the high proportion of defensive high-anxious individuals highlights the need for psychologically based interventions to be delivered earlier. Stratifying the population may allow for more targeted interventions, which could be more cost effective and reduce the number of patients remaining in the care system.

Publications

Franklin, Z.C., Smith, N.C. and Fowler, N.E. (2015) 'Influence of defensiveness on disability in a chronic musculoskeletal pain population.' *Pain Practice. (in press*).

Franklin, Z.C., Smith, N.C. and Fowler, N.E. 'A qualitative investigation of factors that matter to individuals in the pain management process.' *Disability and Rehabilitation. (in press*).

Franklin, Z.C., Holmes, P.S., Smith, N.C. and Fowler, N.E. 'Personality type influences attentional bias in individuals with chronic back pain.' *PLoS ONE. (in press*).

Franklin, Z.C., Smith, N.C. and Holmes, P.S. (2015) 'Anxiety symptom interpretation and performance expectations in high-anxious, low-anxious, defensive high-anxious and repressor individuals.' *Personality and Individual Differences,* 77 pp. 27-32.
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Award for best presentation.

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CHAPTER 1

1.0 Introduction

Chronic musculoskeletal pain is a complex problem and has significant psychological (McInnis et al., 2014), physical (Camacho-Soto et al., 2012) and social implications (Stenberg et al., 2013). Pain is defined as "*an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"* (Merskey et al., 1979). This definition encompasses a range of conditions, such as arthritis, back pain, fibromyalgia, neck pain and chronic fatigue syndrome. Approximately 10 million individuals suffer with chronic musculoskeletal pain with 42% unable to work due to their condition and 19% will eventually lose their jobs (Breivik et al., 2006). There is also a significant effect on the economy, with an estimated cost of £12.3 billion per year for back pain alone (Maniadakis and Gray, 2000). These individuals tend to be heavy users of the healthcare system, with almost half (44%) of the patient population having to wait over a year to receive a diagnosis; and many patients perceive that their pain is not adequately managed (Collett et al., 2010).

Chronic musculoskeletal pain is a subjective experience, which can be difficult to manage, particularly as there is often an inconsistent relationship between pain and pathology. Although pain management strategies exist, the provision of these services is variable across regions. The general awareness of chronic pain conditions has grown over the past decade, however, the provision of services has not kept up and demand continues to surpass supply (British Pain Society, 2005). There is inevitable pressure for hospitals to reduce waiting times, treatment efficacy and the number of patients remaining in the care system, which creates added pressure for the staff within

healthcare services. Given the significant burden upon society and the economy, it is important to improve these services and find more effective management strategies. The main outcome objective for most chronic pain patients is to reduce pain intensity and the resulting disability (Sanderson et al., 2012). Numerous guidelines exist, such as those in the UK provided by the British Pain Society and the National Institute for Health and Clinical Excellence, however, the challenge for clinicians is to identify the correct path for each individual patient. The guidelines emphasise the importance of patient centred care, which aims to take into account the individual needs and preferences of each patient. Current guidelines do not focus on reducing pain intensity through physiological or pharmacological interventions but emphasize the importance of education and knowledge to equip the patient with self-management strategies. Self-management is defined as "*the ability to manage symptoms, treatment, physical and psychosocial consequences and life-style changes inherent in living with a chronic condition*" (Barlow et al., 2002).

The majority of individuals will benefit from an interdisciplinary approach, which addresses different aspects of their pain simultaneously (Jensen et al., 2007). This may involve activity, social interactions, medications and psychological interventions. There is increasing evidence to show that cognitive factors are relevant to the development of treatment response and clinical outcome from chronic pain (Woby et al., 2008; Bair et al., 2003). Pain management programmes (PMPs) are designed to address cognitive factors and to provide patients with self-management strategies in order to reduce their use of healthcare services. Successful self-management can be difficult

for some individuals while others appear able to effectively manage their condition at home, and do not regularly utilise healthcare services. The mechanisms behind these differences between individuals are poorly understood, but have been suggested to be a function of personality type. The majority of studies investigating anxiety and pain have primarily investigated the association between pain related anxiety or state anxiety and pain intensity. Some studies have identified differences between individuals with high or low trait anxiety which predispose individuals to respond to pain related stimuli differently (Eysenck, 1992). Some of these findings are equivocal and may be due to other factors. The inclusion of defensiveness alongside trait anxiety (personality type) has highlighted differences in how individuals respond to treatment and health outcomes in chronic illness populations (Zachariae et al., 2004; Prasertsri et al., 2011; Myers, 2010; Phipps and Steele, 2002). To date, no studies have sought to investigate the role of defensiveness and the interaction with anxiety in the management of chronic pain.

If patients experience and interpret pain differently, they may also require different treatment strategies. The studies within this thesis are designed to provide a greater understanding of how the combination of defensiveness and trait anxiety influenced outcome within a chronic musculoskeletal pain population. This thesis will help to determine whether the management of chronic pain would be enhanced through the use of treatment stratified based on personality type.

CHAPTER 2

2.0 Literature review

2.1 Definitions and models of pain

Pain is a noxious experience that is subjective, provides individuals with information about body function, and prevents further injury by signalling tissue stress. The International Association for the Study of Pain (IASP) classifies pain as "a*n unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"* (Merskey et al., 1979). This definition encompasses not only the sensory element but also the perception of pain. Chronic musculoskeletal pain is a complex condition which has significant psychological (McInnis et al., 2014), physical (Camacho-Soto et al., 2012) and social implications (Stenberg et al., 2013). Chronic pain affects approximately one in five people across Europe (Breivik et al., 2006) and has a significant effect on the economy. The specific financial costs of managing chronic musculoskeletal pain are unknown, however, conditions such as osteoarthritis and low back pain are considered the most expensive to manage (Mäntyselkä et al., 2002; Phillips, 2009). Within the United Kingdom (UK) specifically, back pain is estimated to cost £12.3 billion per year (Maniadakis and Gray, 2000), this is the equivalent of 22% of the annual NHS budget (2014). Back pain alone is the second most common cause of sick leave and approximately 4.1 million days of work are lost each year (Collett et al., 2010).

2.2 Nociceptive pain

Descartes originally conceived of pain in terms of a 'stimulus-response' relationship (Melzack and Wall, 1965). Whereby there is a simple response

within the brain to a noxious stimulus from the body, this nociceptive information is transmitted along defined pain pathways. The biological processes involved in pain perception are no longer simply viewed in terms of this direct relationship. The perception of pain and its threshold are the result of complex interactions between sensory, emotional and behavioural factors. Inflammation and nerve injury to the damaged area can reduce pain thresholds and increase sensitivity to stimuli. On the other hand, in combat situations, soldiers have been reported to experience 'episodic analgesia', whereby they have no initial awareness of a severe acute injury, suggesting that, in some extreme situations, pain thresholds are increased (Hudspith et al., 2006).

Tissue injuries result in a series of physiological responses as a noxious stimulus consisting of nociceptive information informs the processing of pain from the damaged tissue. Four basic processes are involved in nociception: (i) transduction; (ii) transmission; (iii) perception and (iv) modulation (McCaffery and Pasero, 1999; Miller, 2009). Transduction involves the process of converting a noxious stimulus, which can be mechanical, thermal or chemical into a nervous impulse. The free nerve endings of C fibres and A-delta fibres are the primary afferent neurones responsive to noxious stimuli. Nociceptors are exposed to noxious stimuli when tissue damage and inflammation occur as a result of injury. Transmission involves sending the afferent nerve messages to the brain. This occurs in three stages, (i) the pain impulse is transmitted from the site of transduction along the nociceptor fibres to the dorsal horn in the spinal cord; (ii) from there, the spinal cord transmits the stimulus to the brain stem; and (iii) finally through connections linking the thalamus, cortex and higher levels of the brain where perception and

interpretation of the stimulus happen. The C and A-delta fibres terminate at the dorsal horn of the spinal cord: for the pain impulse to be transmitted across the synaptic cleft to the nociceptive dorsal horn's neurones, excitatory neurotransmitters are released which bind to specific receptors. The pain impulse is then transmitted from the spinal cord to the brain stem via two ascending pathways; the spinothalmic and spinoparabrachial pathways. The third stage, perception, involves the interpretation of the stimulus into the perceived pain once the incoming nervous messages reach the brain. This stage is influenced by social and psychological factors, which explains the differing perceptions of pain between both individuals and circumstances. When the stimuli are transmitted to the brain stem and thalamus, three main cortical areas are activated. Firstly, the reticular system is activated which involves the autonomic and motor response to pain, warning an individual to act. Secondly, the somatosensory cortex is then involved in the perception and interpretation of sensations (e.g., intensity and location of pain related to previous experiences). Finally, activation within the limbic system is responsible for the emotional and behavioural responses to pain. The final stage of nociception is modulation; this stage involves changing or inhibiting transmission of pain impulses in the spinal cord. The complex system involved in the modulation of pain is referred to as the descending modulatory pain pathways and can lead to either an increase in the transmission of pain impulses (excitatory) or a decrease in transmission (inhibition).

2.3 Models of pain

Numerous studies have attempted to explain the nature and cause of acute pain resulting in a range of theoretical accounts. These include, the Specificity Theory (Schiff, 1859; cited in Main and Spanswick, 2000), Central Summation Theory (Livingston, 1943), Peripheral Pattern Theory (Weddell, 1955), and Gate Control Theory (Melzack and Wall, 1965; Melzack and Casey, 1968).

The studies within this thesis specifically investigate the influence of personality type on clinical outcome and the interactions of other psychological variables in individuals with chronic pain. The mechanisms of pain perception described above primarily explain the physical aspect of pain, taking little account of cognitive and behavioural factors. The Specificity Theory and Gate Control Theory, however, place differing emphasis on the moderating influence of cognitive factors on the experience of chronic pain. These two theories are discussed more fully in the following sections.

2.3.1 Specificity Theory

The Specificity Theory (Schiff, 1859) has origins which date back to the ancient Greeks and it proposes that pain is a sensory experience signalling tissue damage. The theory propositions that pain is experienced when information relating to tissue trauma is transmitted from the periphery to the cerebral cortex. This explanation of the pain experience appears to be very mechanistic and implies the nervous system plays a passive, transmission role within the experience of pain, and infers a direct relationship between pathology and the pain experienced. Treatments based on this theory assume that correcting the

damage to the underlying tissue will result in reduced pain, however, some findings have cast doubt over the central tenets of the Specificity Theory.

The central notion of Specificity Theory identifies the damage to tissue as the cause of pain, however, pain can be reported in the absence of any noticeable tissue damage (e.g., migraines) (Ashina et al., 2012). In addition, in individuals with chronic back pain there are few objective markers of pathology and a notoriously poor association between the experienced pain and underlying pathology (Hart et al., 1995; Ung et al., 2012). Furthermore, Specificity Theory is unable to explain the phenomenon of 'phantom limb syndrome'. In this syndrome, the limb has been amputated, but the patient still reports experiencing pain in the missing limb (Vase et al., 2012) even after healing of the amputation site.

A further limitation to the theory is its inability to explain episodic analgesia, the sensation of little or no pain despite significant tissue damage (Wall, 1979). Episodic analgesia has been reported in combat situations where injured soldiers frequently refuse morphine, reporting little or no pain despite significant tissue damage (Beecher, 1959). Beecher argues that such transient analgesia is the result of the individual realising that they were unlikely to have to return to the battlefield but were still alive, which blocked their reaction to the pain. It can be concluded that the input was blocked or modulated by cognitive activities that distract attention from the painful stimuli, thereby reducing their interpretation of the intensity of pain. This absence of the experience of pain is not only seen during combat settings, but also within some hospitalised individuals following injury. Melzack et al. (1982) reported that 37% of patients experienced little or no pain at the time of injury. These

findings cast doubt on the validity of Specificity Theory's claim that pain reflects a direct relationship with underlying pathology.

The notion of a direct relationship between pain and pathology, as postulated by Specificity Theory, has been widely challenged. Studies investigating induced muscle damage on the lower back in asymptomatic individuals have found no relationship between pain intensity and such muscle damage (Bishop et al., 2011). In addition, studies using Magnetic Resonance Imaging (MRI) of the lumbar spine have identified 76% of asymptomatic individuals with some form of disc herniation in the absence of reports of pain (Boos et al., 1995). Furthermore, surgical procedures, designed to inhibit the pain transmission by cutting neurological pathways thought to be involved in the interpretation of pain, have resulted in different outcomes for the individual, despite the patients having similar levels of both tissue damage and identical post-operative treatment programmes (Turk and Burwinkle, 2007). As a consequence, of the weaknesses in Specificity Theory, research has been increasingly directed to the study of psychological factors involved in pain perception.

2.3.2 Gate Control Theory

Melzack and Wall (1965) attempted to overcome the limitations of Specificity Theory by proposing the Gate Control Theory of pain. This theory not only described the experience of pain in terms of the mechanisms and transmission of nociceptive stimuli, but also the interaction of physiology and psychology in the pain experience. It proposes that a mechanism in the dorsal horns of the spinal cord act like a 'gate', to either facilitate or inhibit transmission from the

body to the brain on the basis of the diameters of the active peripheral fibres. Transmission through the gate was a result of both the intensity of stimulation and descending impulses from the central nervous system. Melzack and Casey (1968) expanded upon the theory and proposed three psychological dimensions related to the processing of nociceptive stimulation: (i) sensory-discriminative; (ii) motivational-affective; and (iii) cognitive-evaluative. The sensory-discriminative dimension provides perceptual information relating to the magnitude, location and spatio-temporal properties of the noxious stimulation. The motivational-affective dimension stimulated an individual towards either an escape or attack reaction. Finally, the cognitive-evaluative dimension provides the individual with information relating to past-experiences and the likely outcome of different response strategies. These three dimensions interact to influence the mechanisms responsible for the pattern of responses associated with the experienced pain.

Gate Control Theory was the first to implicate central, psychological factors in the experience of pain rather than seeing this as solely the result of sensory inputs. Pain was suggested to be an integration and interpretation of sensory and psychological processes resulting in a perceptual process of a range of incoming stimuli (Turk and Gatchel, 1999). The interpretation of this stimuli is based on a variety of factors including previous experiences and attention to pain related information. Attentional bias is the tendency for patients to selectively attend or avoid information relating to their current concerns. There are, however, inconsistencies within pain research relating to attentional biases towards pain. Some studies have found that patients attend to pain related stimuli (Crombez, Viane, et al., 2013; Crombez, Van

Ryckeghem, et al., 2013) whereas others have found patients avoid threatening information relating to their pain (Lautenbacher et al., 2009). This is particularly pertinent as the model has changed the direction of research and has helped to re-define the understanding of pain. In particular, interventions targeting the modification of attentional and perceptual processes involved in the pain experience developed from the assumptions underpinning Gate Control Theory (Turk et al., 1983). Gate Control Theory has also stimulated research to test the psychological factors involved in the processing and moderating of pain.

2.4 Chronic pain

Acute pain is the immediate nociceptive experience of pain and is usually resolved quickly, however, some conditions do not improve and cause disabling pain for many months and years. Chronic pain is clinically defined, as a condition which lasts for more than three months. Examples of chronic pain conditions include fibromyalgia, chronic fatigue syndrome, temporomandibular disorder and chronic low back pain. Although these conditions are distinct, they share some similar characteristics and patients can be grouped together for the study of responses to and management of chronic pain (Burns, 2000; Perry and Francis, 2012; Schoth et al., 2012; Wetherell et al., 2011). Over the past decade, researchers have investigated factors which contribute to the progression from acute to chronic conditions. The physiological reactions to acute pain are designed to warn individuals of an immediate danger, however, when conditions become chronic this response may no longer be relevant or possible, for example if there is no noticeable pathology (Calvino and Grilo, 2006). In chronic pain, it has been

suggested that long-term changes occur to parts of the central nervous system that are involved in the transmission and modulation of pain (Ko and Zhou, 2004). Other elements such as psychological factors and individual differences are important to the development and experience of chronic pain. Individual's beliefs about their pain, attention to or avoidance of such pain, fear of pain and pain-related coping have all received attention in research. Studies have investigated the relationships between pain and disability and have led to the development of the biopsychosocial model of low back pain and disability (Waddell, 1987).

2.5 Biopsychosocial model of low back pain

The biopsychosocial model developed by Waddell et al. (1987) attempts to describe the complex nature of chronic low back pain (CLBP) (Figure 2.1). This model doesn't describe how chronic pain develops, but rather offers a description of the factors affecting the experience of pain at any specific time. This model incorporates physiological, biological, cognitive, affective, behavioural and social factors linked to the experience of pain and disability. Such factors are considered to be interdependent and to develop over time. Psychological factors may affect the interpretation of physical stimuli and perceptions of disability (Main and Watson, 1996) or have an influence on hormone production (Bandura et al., 1988; Bandura et al., 1987). The strength and type of social factors may reinforce or discourage particular behaviours and reactions to painful experiences (McCluskey et al., 2011; Romano et al., 2000).

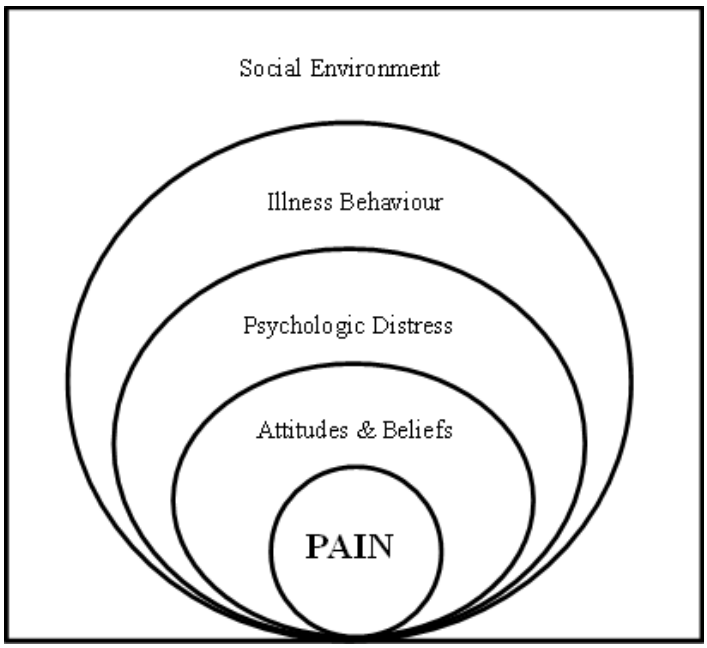

Figure 2.1. The biopsychosocial model of low back pain and disability (Waddell et al., 1987).

A central tenent of the biopsychosocial model is the distinction between illness and disease. Disease has been defined as "*a pathological process, most often physical and is some deviation from a biological norm. There is some objectivity about disease which doctors are able to see, touch, measure, smell*" (Boyd, 2000). Illness is defined as "*a feeling, an experience of unhealth which is entirely personal, interior to the person of the patient. Sometimes illness exists where no disease can be found"* (Boyd, 2000). These definitions have important implications for the clinical management of chronic pain, which will, in many cases, be more akin to illness than disease.

For more than a century, treatments for chronic low back pain (CLBP) such as manipulation, massage and heat treatment have been based upon a biomedical model, primarily focused on disease. The biomedical model follows a similar logic to Specificity Theory, i.e. that correction of pathology is the route

to pain reduction. CLBP interventions, based on the biomedical model, have often proven to be ineffective (Ostelo et al., 2003). This is unsurprising given the limitations of Specificity Theory to adequately explain the processes involved in the experience of CLBP. In contrast to biomedical management strategies, interventions centred around cognitive-behavioural therapy, which are based upon the biopsychosocial model of illness, have shown more encouraging results (O'Sullivan et al., 2013; Truchon, 2001). Consequently, such interventions are now routinely included in clinical guidelines for chronic pain management and are the preferred types of intervention (Levy et al., 2014; Skinner et al., 2012; Turk and Okifuji, 2002).

The biopsychosocial model's focus on illness helps to explain some of the more complex aspects of CLBP, for which the biomedical model fails to account. For instance, the relationship between pain, disability and psychological distress is often inconsistent, particularly when there is no observable pathology (Ung et al., 2012). Due to its focus on disease, the biomedical model is unable to explain this, however, by focussing on illness, the biopsychosocial model can partially explain the relationship between pain, disability and psychological distress. The biopsychosocial model suggests that the inconsistencies between these three factors are the result of biological changes, psychological status and social context, which regulate perception and reaction to pain (Covic et al., 2003; O'Sullivan et al., 2013).

In a review of the management of CLBP, Adams and Dolan (2005) highlight the increased research emphasis on psychosocial factors as predictors of behaviour within chronic back pain patients. These include the effects of pain-related anxiety and depression on decisions to take time off

work or to attend treatment sessions. They also highlight the role of biological factors such as genetics, ageing and spinal loading history which may increase the risk of chronic back pain. Psychological factors also appear important in assessing pain behaviour and the management of chronic back pain. Not all individuals will develop chronic pain, however, the pain may become more chronic with attitudes, beliefs, distress and illness behaviour playing an important role in the development of chronicity and disability. The understanding and management of chronic conditions have been accepted to be biopsychosocial challenges, which frequently vary between individuals. As a result, return to work and reductions in pain and disability are used as common outcome measures. The biopsychosocial model is a model of illness rather than a model of rehabilitation. It does not explain how different individuals cope with pain and how some manage to get on with their lives, while others become severely disabled.

2.6 Fear-avoidance model of chronic pain

One of the most widely used models for explaining how psychological factors affect the development of chronic pain is the fear-avoidance model (Letham et al., 1983; Vlaeyen et al., 1995). Fear-avoidance beliefs are an exaggerated fear of pain leading to an avoidance of physical activities that are anticipated to cause pain (Vlaeyen and Linton, 2000). The fear-avoidance model initially proposed by Letham, et al. (1983) and then developed by Vlaeyen et al. (1995), is a model which offers an explanation of the cognitive and behavioural processes involved in the responses to back pain. The model was proposed to describe the mechanisms involved in exaggerated pain perception and to

explain why some individuals progress from acute to chronic pain conditions. The basic structure of the model is presented in Figure 2.2. The figure shows how an individual may follow one of two routes depending on how they interpret pain, or perceive the risk of their pain. When pain is perceived as non-threatening, individuals carry on with daily activities making only clinically-appropriate adaptations until full recovery. In contrast, a catastrophic (mis)interpretation of pain leads to the individual developing a disproportionate and irrational fear of pain, or its perceived consequences, to a state where fear of movement (kinesiophobia) leads to situational avoidance or escape. This avoidance of movement, can, if associated with cessation of critical social or employment activities, lead to the development of disuse, disability and depression which evolve in a vicious cycle.

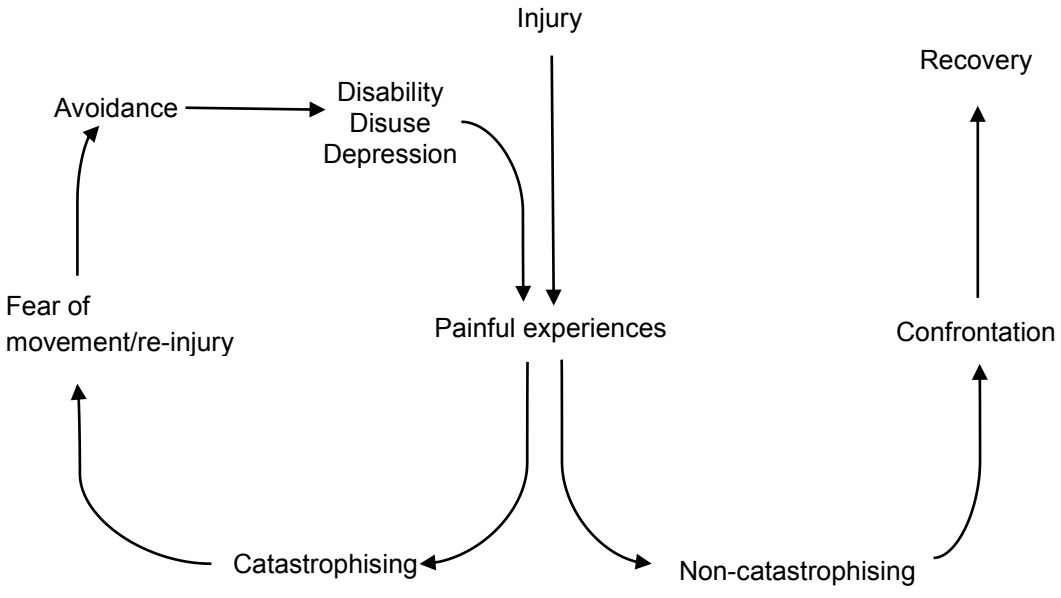

Figure 2.2. The fear-avoidance model of chronic pain (Vlaeyen et al., 1995).

The predictions of the fear-avoidance model have been widely supported within the literature concerned with chronic back pain (Crombez et

al., 2012). Support has been provided for the suggestion that pain-related fear and catastrophising are significantly related to pain and disability (Grotle et al., 2010; Picavet et al., 2002). Catastrophising is defined as an exaggerated negative mental set due to actual or anticipated painful experiences (Sullivan et al., 2001). Correlational studies have demonstrated a relationship between catastrophising and intensified pain in various musculoskeletal pain conditions (Buer and Linton, 2002). In addition, reduced catastrophising has been found to mediate reductions in pain intensity and disability (Smeets et al., 2006). Leeuw, Houben et al. (2007) found that levels of pain catastrophising at baseline were a precursor of pain-related fear six months later. Smeets et al. (2006) suggested that exposure to activities associated with pain challenged the patients' association with pain and threat, thereby causing them to change their perception of threat. Mannion et al. (2001), identified that an active therapy programme was able to modify fear-avoidance beliefs as a result of the positive experience from therapy increasing individuals' daily activities. This finding suggests that individuals who interpret their initial levels of pain catastrophically are more likely to experience increased fear of movement as time progresses, leading to increased levels of disability and reduced physical activity. Whilst catastrophising and fear avoidance beliefs are not always related to reported pain intensity, their relationship with disability is well established (Gheldof et al., 2010; Woby et al., 2004a).

Further support for this model has shown that pain-related fear and catastrophising are associated with hypervigilance to symptoms and may be reflected in increased self-reports of pain and disengagement from activities (Vlaeyen and Linton, 2000). Intense or threatening perceptions of pain subvert

attentional resources and may interrupt the daily activities of the individual (Pincus and Morley, 2001). Hypervigilance to pain symptoms has been shown to be dependent on the presence of pain-related fear and has a negative effect on performance (Van Damme et al., 2006). This has been suggested to be due to such patients allocating attention to bodily signals at the expense of performance in a particular task. There has been contradicting evidence to this, as when a cognitive distracting task is introduced at the same time (e.g., performing a concurrent reaction-time task) physical performance improves in patient groups (de Gier et al., 2003). Individual differences in pain catastrophising have also been shown to influence attentional interference. Individuals who are high catastrophisers have more difficulty disengaging their attention from the pain-related stimuli due to the anticipated threat (Asmundson, Wright, et al., 2005; Crombez et al., 2005). Interestingly, de Gier et al. (2003) found that initial self-reported pain intensity was more predictive of physical performance than post-physical activity pain intensity levels. This suggests that the anticipation of pain may cause individuals to selectively attend to their somatic sensations and interpret them as more painful and disabling than attending to the actual task.

Disability and disuse due to chronic back pain not only affect individuals at home but also in the work place. Higher fear-avoidance beliefs have been significantly associated with disability, both on self-reported measures (Boersma and Linton, 2005; Kovacs et al., 2008) and gait speed (Camacho-Soto et al., 2012). There are limited studies that have investigated the disuse element of the fear-avoidance model. In a recent review, Griffin et al. (2012) found that between controls and individuals with chronic pain, there was no

significant difference in the amount of physical activity undertaken, however, the distribution of activities over the course of the day was found to differ. This finding is inconsistent with the fear-avoidance model, however, it is possible that patients avoid specific activities without reducing their overall activity. Hansenbring et al. (2001) suggested that some individuals fear their pain and avoid activities, whereas others ignore their pain and persist with physical activity. These differences could be due to differing attentional and interpretive biases between individuals. The mechanisms underpinning such differences between individuals clearly warrants further investigation.

In Leeuw, Goossens et al.'s (2007) review of the fear avoidance model, they mention two aspects of disuse which seem relevant to the fear-avoidance model; physical deconditioning and disordered muscle coordination. As expected, lower muscle strength is frequently found in CLBP patients compared to asymptomatic controls, however, this reduced maximal performance could be due to pain-related fear (kinesiphobia) (Verbunt et al., 2005). Buer and Linton (2002) found higher fear-avoidance beliefs more than double the risk of reduced activity levels. In contrast, increases in activity levels are often associated with decreases in pain-related fear, disability and pain vigilance (Vlaeyen et al., 2002). Some cross-sectional studies have found patients with low physical activity to have significantly higher scores in both fear-avoidance beliefs and pain catastrophising compared to individuals with higher physical activity (Elfving et al., 2007). Longitudinal studies have questioned the validity of the fear-avoidance model in explaining the transition from acute to chronic low back pain, in particular the disuse aspect inherent within the model (Leonhardt et al., 2009; Sieben et al., 2005). Previous studies

have shown that hyperactivity and muscle guarding would be more likely to occur during a movement task that would be perceived as more threatening to the patient. Leonhardt et al. (2009) conducted both cross-sectional and longitudinal studies to identify whether fear-avoidance beliefs were associated with physical activity levels. Their results failed to support the disuse prediction within the fear-avoidance model, which suggests disuse in daily activities. They found that after one-year, individuals with chronic pain increased their activity levels and initial fear-avoidance beliefs did not predict final physical activity levels. The authors suggested that fear-avoidance beliefs may represent a cognitive schema that does not limit general activity but is directed to the avoidance of specific movements for the individual. Once individuals begin to adapt to coping with a chronic condition they may become more confident in completing daily tasks (e.g., washing, shopping etc.). Therefore, other psychological factors, such as self-efficacy, play a crucial role in reducing fear-avoidance beliefs for specific activities. Consequently, a more detailed assessment of these activities appears important upon first assessment to identify which activities individuals are avoidant of and whether fear-avoidance beliefs are associated with them.

Pincus et al. (2006) concluded that there is little evidence for fear-avoidance as a key predictor of poor clinical outcomes in both the short (three months) or longer term (12 months), with other factors such as depression and distress appearing more important predictors of outcome. Boersma and Linton (2005) employed a cross-sectional design comparing patients at three different stages of pain duration (< 1 year; 1-3 years; > 3 years). Interestingly, no relationship was found between fear-avoidance beliefs and function when

pain had lasted less than 1 year in duration. Pain intensity was not significantly related to fear-avoidance at any stage of pain duration, however, depression was associated with function, irrespective of chronicity. This suggests that fear-avoidance may be important when applied to specific activities, although, other psychological factors (e.g., depression) appear more likely to contribute to the development of chronic pain. In addition, differences in pre-disposition to attention and prior experience of pain may be important to identify how individuals respond to the development of chronic pain. There is a need to consider these factors in relation to this model and to enable more effective comparison between results.

Whilst there is experimental evidence in support for this model, observational studies have shown contradictory results (Pincus et al., 2010). Although there is evidence of heightened pain-related fear following catastrophising about pain (Leeuw, Houben, et al., 2007), not all individuals complete the full, negative cycle predicted by the fear-avoidance model. Other factors such as re-occurrence of pain, pain intensity, initial levels of disability, social factors, treatment and genetic factors should also be taken into consideration. If it were possible to identify, at an earlier stage, those patients at greatest risk of maladaptive responses to their pain, treatment guidelines could be more specifically targeted to those individuals. Further research is required to establish criteria for identification of these individuals.

2.7 Pain management

Pain is a complex phenomenon with the interaction between biological, psychological and social factors influencing the individual. Individuals with chronic pain are regular healthcare users, often seeking relief from their symptoms, particularly if it affects their day to day living. Due to the poor link between pathology and experienced pain, pain management is often focussed on addressing how to live with symptoms and does not necessarily aim to address the cause or underlying pathology. Therefore, it is important for treatment programmes to not only address the biological factors, but to also consider the psychological and social factors which may have an impact on the individual.

2.7.1 Guidelines

Individuals with chronic pain often present to pain clinics with a range of co-morbid conditions, such as depression, anxiety, insomnia, isolation or overuse of medicines (Breivik et al., 2006). The importance of a biopsychosocial approach in the management of chronic pain was highlighted in the previous section. To enhance the rehabilitation of chronic musculoskeletal pain conditions, many interventions attempt to address biological, psychological and social factors. These interventions are often underpinned by cognitive behavioural techniques and include an exercise programme, educational component and goal setting exercises. Cognitive behavioural techniques are based on the idea that a person's affective responses and behaviours are determined by their beliefs and cognitions. Three of the studies within this thesis focus on general chronic musculoskeletal pain conditions and one study

specifically investigates patients with chronic low back pain. Therefore, the main recommendations of the current Pain Management Programme (PMP) guidelines (British Pain Society, 2013) and the more specific National Institute for Health and Clinical Excellence (NICE) low back pain guidelines (National Institute for Health and Clinical Excellence (NICE), 2009) are described within this review.

2.7.2 British Pain Society guidelines

The British Pain Society has recently updated its guidelines for Pain Management Programmes (PMP) (British Pain Society, 2013) applicable to any chronic musculoskeletal pain condition. A PMP is a psychologically group based rehabilitative intervention for people with chronic pain, which remains unresolved by other treatments. The guidelines suggest that PMPs should last circa 36 hours, with the aim to improve the physical, psychological, emotional and social dimensions of quality of life for people with persistent pain. PMPs focus on the patient's physical and psychological wellbeing, rather than seeking to treat a disease or biomedical damage. PMPs are not designed to focus on pain relief, but aim to improve quality of life, working towards improving function and self-reliance for patients to manage their pain. By improving these factors, patients have reported improvements in pain intensity (King and Robinson, 2014), return to work and function, which are all important goals for patients (Morley et al., 1999). In order to achieve these goals PMPs consist of an education element and guided practice.

Education is often provided by a multidisciplinary team focused on pain physiology, pain psychology, healthy function and self-management of pain.

The aim of the education element is to allow patients to discuss difficulties they have in particular situations and to explore ways to resolve them. Patients are informed about pain mechanisms such as anatomy and physiology of pain pathways, negative affect and avoidance, exercise for better health and improved function, advantages and disadvantages of using medications and self-management of flare-ups and set-backs. Other information introduces treatment principles and rationales by linking the above pain mechanisms to guided practice. This may include cognitive strategies to deal with psychological effects of persistent pain, principles of goal setting, cues and reinforcement to change habits and maintain those changes as well as strategies to improve sleep. PMPs are an opportunity for patients to practice these methods through guided practice with a clinician and to help patients build a more positive way of thinking. Patients are generally encouraged to practise these methods at home, particularly through goal setting, and then to review their progress and goals with staff at the next session. The guided practice element of PMPs also encourages patients to exercise and improve fitness and mobility. The group environment adopted by PMPs helps patients to improve their confidence in movement which, in turn, leads to improved function. Using various cognitive therapeutic methods, clinicians help the patient to identify, elaborate and challenge appraisals, beliefs and processing biases related to pain and activity. In addition, patients are provided with attentional control methods which allow patients to undertake a graded increase in safe, but feared activities, based on each patient's level of anxiety.

The PMP guidelines recognise that rehabilitative and physical treatments are beneficial, and suggests that when the patient's experience of

pain is more complex, the psychological components of pain are best addressed in a PMP which is based on cognitive behavioural principles (e.g., cognitive behavioural treatment (CBT)) (Koes et al., 2006). PMPs have been shown to be effective (Morley et al., 1999; van Tulder et al., 2001; Williams et al., 2012).

A number of systematic reviews have shown PMPs, which include CBT, to significantly reduce negative affect and disability and to significantly enhance coping and improve physical performance (Morley et al., 1999; Williams et al., 2012). The design of psychological treatments has been informed by theories of human behaviour focused on psychological processes thought to underlie or significantly contribute to pain, distress and disability. Psychological interventions focussed on improving physical functioning and encouraging self-management are used regularly within modern pain management practice (Hill et al., 2011). It has been suggested that if delivered at an earlier stage these interventions can be more effective for the patient and more cost-effective (Linton, 2000; Linton, 2005; Pincus et al., 2002).

Healthcare commissioners and patients expect clinicians to deliver PMPs effectively. There is no single, *a priori*, defined outcome for a course of treatment as each patient's goals are determined by the individual. The British Pain Society guidelines suggest that the following outcomes should be evaluated as standard practice; emotional wellbeing, physical functioning, social activities, pain experience, changes in healthcare use, changes in work status, and quality of life (Turk et al., 2008). Although there are studies which demonstrate the effectiveness of PMPs and that they can reduce pain-related healthcare usage (Clare et al., 2013), successful outcome is by no means

universal and some patients appear to improve more than others. Therefore, more research is needed to identify the underlying mechanisms and define subgroups which may benefit more from particular elements of the current treatment guidelines (Airaksinen et al., 2006).

2.7.3 Low back pain guidelines

The National Institute for Health and Care Excellence (NICE) has produced a set of guidelines for clinicians including recommendations for the treatment and management of non-specific low back pain (National Institute for Health and Clinical Excellence (NICE), 2009). The guidelines are applicable to the management and treatment of the early phases of recurrent, non-specific back pain that has lasted between 6 weeks and 12 months (Savigny et al., 2009). The guidelines encourage initial attempts to engage the patient in the self-management of their condition. Where this is not possible or is unsuccessful, one or more courses of exercise, physical, manual or alternative (e.g., acupuncture) therapy can be prescribed. Similar to PMPs, education about their condition is highlighted as a key component to encourage patients to self-manage their pain. Clinicians are also encouraged to highlight information about the nature of the patient's back pain and encouraging them to be physically active and to carry on with their normal activities where possible. Where the initial treatment is unsuccessful in alleviating symptoms and associated disability and where patients demonstrate psychological distress, the NICE guidelines suggest they be considered for referral for a combined psychological and physical treatment programme, typically consisting of up to 100 hours of intervention often hospital based (National Institute for Health

and Clinical Excellence (NICE), 2009). The progression of patients through the stages of treatment and ultimately to specialist back pain management programmes is largely determined by the persistence of the patient in repeatedly presenting their case to clinical service providers and continued self-report of disability.

Although the NICE guidelines suggest patients with low back pain who present with a high level of disability and distress should have a combination of physical and psychological treatment, there are no specific guidelines on when or how to measure such levels of disability or distress. As a result, decision making for referral can be inconsistent. Hill et al. (2008) developed the Keele STarT Back Screening Tool as a short, primary-care questionnaire designed to stratify the need for treatment based on low, medium and high psychosocial risk in low back pain patients. Low risk patients are individuals with few negative prognostic indicators, suitable for primary care management according to best-practice guidelines (e.g., analgesia, advice, education). Medium risk patients are individuals with an unfavourable prognosis with high levels of physical prognostic indicators, appropriate for physiotherapy. The high-risk subgroup consists of patients with a very unfavourable prognosis, with consistently high levels across psychosocial prognostic indicators, appropriate for management by a combination of physical and cognitive behavioural approaches.

Hill et al. (2011) reviewed the STarT Back tool in a randomised control trial comparing the clinical effectiveness and cost effectiveness of stratified primary care (intervention) with non-stratified, current best practice (control). Firstly, patients were allocated into one of the three risk groups (low, medium

and high) using the STarT Back tool. Second, the three groups were allocated into either an intervention or the control group. Demographic data and clinical outcomes were gathered before randomisation, four, and 12 months later. The primary outcome measure was disability (measured using the Roland Morris disability questionnaire) at 12 months post intervention. Secondary outcomes were referral for further physiotherapy, pain intensity, pain catastrophising, fear avoidance, anxiety, depression and health related quality of life, STarT Back Screening tool risk-subgroup reduction, perception of overall change in back pain, healthcare resource use and costs over 12 months, number of days off work and satisfaction with care. At four and 12 months post-intervention, the stratified care group showed a significant reduction in disability compared to the control group, although the effect sizes were very low. At four months, the secondary outcome measures were significantly in favour of the intervention for pain intensity, catastrophising, fear, anxiety, depression, general health, STarT Back tool risk reduction, and global change. At 12 months, there were also significant changes in favour of the intervention group for catastrophising, fear, depression, general health and risk reduction. The patients in the intervention group were more likely to be satisfied and took fewer days off work because of back pain. Over the 12 month period the societal benefit, from fewer work days lost because of back pain, corresponded to a mean cost saving of £675 for the intervention group compared to the control group. Hill et al. (2011) propose that a substantial number of referrals based on clinical judgement alone (control group) may be unnecessary and that many low risk patients were receiving unnecessary treatment in current practice. In this trial, only 7% of the low risk intervention

patients were referred compared to 49% in the low risk control group. In contrast, 40% medium risk and 32% high risk patients in the control group were not offered further treatments which is likely to have contributed to their relatively small change in disability compared to the intervention group at four and 12 months. These results highlight the benefit of the use of psychologically informed stratification for patients. Further research is needed to establish how these benefits can be sustained long term as not all measures continued to improve. Current research has shown the benefits of using this tool within a primary care setting to identify patients who are more likely to have an unfavourable outcome at four months (Von Korff et al., 2014) and to identify those who may benefit from different treatment regimes (Fritz et al., 2011; Main et al., 2012). This was the first trial to provide an evidence-based stratified management approach to target the provision of primary care. Further research needs to be done to identify the best factors upon which to base the stratification of patients. In addition, it would be beneficial to identify if there are underlying mechanisms, which may predispose individuals to be classified into one of the risk groups. Identifying these factors may lead to improved healthcare costs in secondary care.

2.8 Satisfaction with pain management

Treatment guidelines provide a useful tool for clinicians to have a structured approach to treatment. More recently, there has been an increase in research investigating patient satisfaction with treatment for chronic pain (Beattie et al., 2005; Butler and Johnson, 2008; Casserley-Feeney et al., 2008; Dworkin et al., 2011; Henschke et al., 2013). The majority of studies indicate that a high

proportion (68%-91%) of patients with chronic musculoskeletal pain report they were satisfied with treatment (Stephens and Gross, 2007). From this research has come a clearer understanding of the reference points patients use to identify their satisfaction with the care they received. The findings have shown that relationships with professionals, therapist characteristics, clinical outcome and treatment process are strong predictors of patient satisfaction (Fitzpatrick, 1991; Trentman et al., 2012; Wensing et al., 1994). Patients tend to determine these factors based on pre-conceived expectations of treatment and if the services they receive match these expectations. George and Hirsh (2005) investigated whether patients were satisfied with their symptoms (e.g., their level of pain) after physical treatment for low back pain. They identified that the main predictor of patient satisfaction with symptoms at six months post-treatment was whether or not treatment expectations were met. Initially, patients rated their expectations for complete symptom relief (range 1 (not likely) to 5 (extremely likely)). At six months patents rated whether their expectations for symptom relief had been met (range, 1 (definitely not) to 5 (definitely yes)). All three satisfaction measures (satisfaction with symptoms, overall results of treatment, and whether or not they would undergo the same treatment again) were significantly associated with whether treatment expectations were met at six months. Some individuals may be more optimistic about treatment, and feel less satisfied if their higher expectations are not met. It may therefore be beneficial for clinicians to try to manage the treatment expectations of patients, particularly as some individuals may be more pessimistic or optimistic about their treatment, which could then impact on treatment satisfaction. Although only 40% of patients were satisfied with their

symptoms, 90% of patients indicated they would have the same treatment again. This study highlights the importance of differentiating the domains of patient satisfaction and of treating satisfaction as a multidimensional concept.

The relationship between the therapist and patient has been shown to be an important factor in the treatment process, particularly for individuals with chronic pain (Hills and Kitchen, 2007). Satisfied patients have been shown to be more likely to follow their prescribed path of care and have a better relationship with their healthcare practitioner (Beattie et al., 2005; Fitzpatrick and Hopkins, 1981). On the other hand, dissatisfied patients perceive their healthcare services as less effective and, as a result, have a higher attrition rate from rehabilitative care (Orton et al., 1991). Casserley-Feeney et al. (2008) specifically investigated patient satisfaction with physiotherapy care for musculoskeletal pain. They identified that greater satisfaction with care was associated with friendly, polite staff who were professional and knowledgeable and whom the patients thought were approachable and showed that they cared. Other studies have reported the ability of the therapist to communicate effectively as an important factor when rating satisfaction (Cooper et al., 2008; Cousin et al., 2012). This was particularly the case when explaining the condition in more detail and providing self-management strategies (May, 2001; Hills and Kitchen, 2007). Through the use of patient interviews, Cooper et al. (2008) investigated factors which were important to the patient in their physiotherapy care for chronic low back pain. They identified that the communication of the therapist was a key factor that also influenced other dimensions of care, which were important to them (e.g., individual care, decision-making, information, and organisation of care). Participants were

particularly satisfied with their therapist's communication when treatments and the reason for these treatments were explained. Cooper et al. (2008) highlighted the importance for adapting communication styles based on the individual characteristics of the patient. Studies have found that some patients want to be actively involved with their decision making and treatment planning, whereas others do not want to be involved and would prefer to be prescribed a treatment programme (Chewning et al., 2012). These individual differences may be linked to the personality type of patients and may allow clinicians to tailor their approach, resulting in higher patient satisfaction and possibly better outcome.

When evaluating the efficacy of treatment regimes not only is it important to specify the type of patient satisfaction, but also the timing of when patient satisfaction is measured. Patient satisfaction is often measured at the end of treatment, with a focus on outcome and as a result there may be memory bias. Whereby, patients may forget any initial improvements they had at the start of treatment and only focus on their current level of pain, rather than the whole treatment experience. Towards the end of treatment, patients may be experiencing lower levels of pain as a result of developing more effective coping strategies. Therefore, they may report high satisfaction if the question is primarily focussed on outcome, rather than the treatment process. Patients who have not seen a change in pain may be dissatisfied with outcome, even though the treatment process was good. Patients who do not see a change in their pain, may be more likely to drop-out at an earlier stage of treatment, this could be due to patient expectations not being met. Research using qualitative methods has highlighted that patient expectations of

treatment are not solely based on an improvement in pain, but mainly the quality of the process and the therapist's characteristics (May, 2001).

Higher satisfaction is sometimes, but not always, related to an improvement in pain symptoms (Hills and Kitchen, 2007; May, 2001), with differences often shown between acute or chronic pain patient groups. Individuals with acute pain are generally more optimistic of a positive outcome, whereas individuals with a chronic condition are more doubtful that they will receive any improvement in their symptoms (Hills and Kitchen, 2007). Hills and Kitchen (2007) conducted a series of focus groups with acute and chronic pain patients. The authors found that in contrast to acute pain patients, individuals suffering from chronic pain had unrealistically high expectations or were uncertain of the treatment process but continued to expect improvement in their symptoms. In addition, they found that patients, either with chronic pain or with a negative outcome, tended to report a more impersonal relationship with the therapist. In particular, if the patient felt they were not involved in the treatment process this was associated with a negative impression of the treatment and affected their relationship with the clinician. From the therapist's perspective, this can lead to the patient being perceived as a 'problem patient', particularly if they are unwilling to take part in self-management strategies or continue to return for treatment (Thomson, 2000).

The quality and efficiency of how care is organised is a key factor of patient satisfaction (Casserley-Feeney et al., 2008; Cooper et al., 2008; Hills and Kitchen, 2007; May, 2001). Patients were more satisfied if the clinic provided flexible hours, parking and approachable support staff. Satisfaction was lower if the overall standard of the premises was low, poor appearance of

staff or if there were long waiting times. Although these are important factors to the overall rating of satisfaction (Hush et al., 2011) and influence patients' perceptions of treatment, it is unlikely that these factors will have a direct impact on their level of reported pain or disability. Although those factors may influence levels of anxiety and negative affect, which are known to lead to negative reporting of symptoms, resulting in lower outcome scores. Therefore, it is important to consider the organisation and accessibility of factors surrounding the clinical environment.

The relationship between patient satisfaction and treatment outcome has provided equivocal results, with few longitudinal studies investigating chronic pain patient groups. As previously mentioned, patients generally report high satisfaction with care; however, satisfaction with symptoms (outcome) tends to be lower. Henschke, et al. (2013) found that 76% of patients were satisfied with the care they received whereas only 55% were satisfied with their symptoms at 12 months. Unsurprisingly, satisfaction with symptoms has been significantly associated to treatment outcome (pain intensity and disability) at six and 12 months post intervention (George and Hirsh, 2005; Hazard et al., 1994). Patients who are satisfied with their symptoms reported higher physical functioning and lower pain intensity at six months than patients who were dissatisfied with their symptoms (George and Hirsh, 2005). May (2001) identified that although an improvement in pain intensity was an important issue, patients also expressed a satisfaction with outcome when they were taught self-managing strategies which meant they did not have to seek further treatment. In May's (2001) study, patients accepted they had a chronic condition that could not be cured, but recognised that an important

outcome was an improvement in daily functioning. In particular, the self-management strategies taught to them by the therapist during the care process gave more consistency to daily life by reducing the number of 'bad' pain days. Such research suggests that once a patient comes to terms with the fact they have a long-term condition, pain no longer becomes the main issue, with their ability to cope becoming more important. Poor coping skills have been associated with increased anxiety associated with the performance of daily tasks often linked to an increased fear of movement associated with such activities (Linton and Shaw, 2011). This can lead to the avoidance of certain tasks and a consequential cycle of disuse, disability and a greater feeling of isolation. In turn, this tends to heighten their movement-related anxiety and depression and reduce the likelihood of successful rehabilitation (see fear avoidance model section 2.6).

Considering the high volume of research demonstrating the complex interaction between chronic pain, anxiety and depression, it appears likely that these psychological factors may affect patient satisfaction with treatment. McCracken et al. (2002) found that depression and pain-related anxiety were unique predictors of treatment satisfaction at six months in a heterogeneous pain population. In support of these findings, Henschke et al. (2013) investigated predictors of satisfaction with care and symptoms in patients with acute low back pain. At 12 months, pain intensity and lower depression had a strong association with satisfaction of outcome. Hirsh et al. (2005) investigated the predictors of patient satisfaction with treatment and the relationship between satisfaction and compliance with treatment recommendations in a group of chronic pain patients. Patients completed questionnaires assessing

ratings of pain, depression, anxiety, compliance with treatment, and satisfaction with treatment at first assessment and at six-month follow-up. The clinicians involved with the treatment programme also completed the Health Professional Compliance Evaluation, to assess whether the patient had been compliant with the treatment recommendations. In line with previous findings, ratings of satisfaction with care were significantly higher (77%) than ratings of satisfaction with improvement in pain intensity (56%). Patients who were more satisfied with their improvement in pain intensity were more compliant with treatment recommendations, measured both by the therapists and the patients' own compliance ratings. Patient and clinician interaction, pain relief and anxiety at treatment onset explained 50% of the variance in ratings of satisfaction with care. Suggesting that patients' levels of anxiety at the start of treatment may affect their perception of the care they receive, with higher pre-treatment anxiety leading to lower levels of satisfaction with care. Patients who enter the treatment process with heightened anxiety were more likely to feel they have an impersonal relationship with their therapist (Hills and Kitchen, 2007). Hirsh et al. (2005) found that patient and clinician interaction and pain relief accounted for 56% of the variance in ratings of satisfaction with improvement.

The results from the three studies discussed suggest that distinguishing between the different elements of patient satisfaction is important, however, it also highlights the contribution of psychological factors such as anxiety and depression to ratings of patient satisfaction. Where measured, psychological variables have consistently been shown to be an important factor in predicting treatment outcome and more generally the satisfaction with the care process

(Lewis, Holmes, et al., 2012; Linton, 2001). Early interventions aimed at reducing patients' anxiety and depression at the onset of treatment could also influence factors such as the patient-therapist relationship, thereby potentially improving overall satisfaction which may, in turn, influence treatment outcome.

2.9 Psychological factors

Both anxiety and depression have been identified as predictors of satisfaction with care and outcome from treatment (measured through reductions in pain intensity and disability). Over the past decade it has become widely accepted that chronic pain disorders are not solely physical problems, with psychological factors playing an important role in both the response and management (Linton, 2000; Woby, Roach, et al., 2007). Specifically, the interpretation of how patients respond to pain and disability is generally understood and managed using the biopsychosocial model as a key theoretical reference point (Pincus et al., 2013).

Psychological factors are relevant throughout the treatment and management for chronic pain, however there is a complex relationship between such factors and clinical outcome (Bair et al., 2013; Woby et al., 2008). Chronic musculoskeletal pain tends to have a notoriously poor association between reports of pain and underlying pathology, which can make it difficult for patients to understand the nature of their condition (Hart et al., 1995). Some patients report how their expectations and satisfaction with treatment change throughout the process as they develop effective coping strategies which focus on psychological factors. Psychological factors, such as anxiety, catastrophising, kinesiophobia, self-efficacy, and depression, are

all widely recognised as important predictors of clinical outcome, supporting the need for them to be considered within treatment regimes. The evidence relating to the role of these factors is considered in the following sections.

2.9.1 Catastrophising

Catastrophising is defined as the existence of exaggerated, negative worry during or in anticipation of an upcoming event (Sullivan et al., 2001). As discussed earlier, pain catastrophising has been proposed to play an important role in the fear-avoidance model and is one of the most robust psychosocial predictors of the experience of pain. Studies have found a strong relationship between catastrophising and other measures of pain sensitivity in experimental pain testing paradigms, both in asymptomatic groups and within various chronic pain groups (Edwards et al., 2006; Sullivan et al., 2001). Catastrophising has also been associated with increased reports of pain, increased visits to healthcare professionals and heightened attention to somatic symptoms (Graves et al., 2014; Turner, Brister, et al., 2005). Pain catastrophising has been consistently demonstrated to be associated with negative pain-related outcomes in diverse patient groups including mixed chronic pain (Severeijns et al., 2002), low back pain (Wertli et al., 2014), arthritis (Edwards et al., 2011), neck pain (Thompson et al., 2010), fibromyalgia (Campbell et al., 2012) and asymptomatic individuals participating in experimental pain procedures (Sullivan et al., 1997).

Pain catastrophising has been suggested to have three components, magnification, rumination and helplessness and has been applied in the context of Lazarus and Folkman's (1984) transactional model of stress and

coping. A main tenent of this model is the distinction between primary and secondary appraisal and reappraisal which act in a transactional manner to shape the resulting cognitive and behavioural coping strategies (Lazarus and Folkman, 1984). Primary appraisals relate to judgements about whether a potential threat is ambiguous or stressful. Secondary appraisals relate to beliefs about ability to cope with the current situation taking into account resources available. The reappraisal process involves the constant monitoring of the stimulus situation and coping strategies, with the primary and secondary appraisals being modified if necessary. Severeijns et al. (2004) suggested that magnification and rumination reflected primary appraisals, whereas helplessness may reflect secondary appraisals of the inability to cope.

It has been proposed that pain catastrophising is also associated with attention and information processing biases. Specifically, higher levels of catastrophising are associated with an amplification of the pain experience via exaggerated attentional biases and negative information processing. Van Damme et al. (2004) conducted a study using a cueing paradigm task in a group of pain-free individuals. The cueing paradigm used by Van Damme et al. (2004) involved cues which were either pain or tone stimuli, and was designed to investigate whether participants are more likely to engage or disengage from pain (e.g., electrocutaneous stimuli through an electrode on the forearm) when performing an attention demanding task. Participants were initially given a cue (either pain stimuli or tone stimuli) followed by a target word on the computer screen (either the word pain or tone) to which they responded on a reaction time key. It was proposed that difficulty disengaging from pain cues would result in a slower reaction time to either target word. Van

Damme et al. (2004) found that patients experiencing high catastrophising had difficulty disengaging from pain, suggesting that catastrophic thinking enhances the attentional demand towards pain. In support of this, Vancleef and Peters (2006) examined performance on an auditory discrimination task during electrocutaneous stimulation in a group of healthy, pain free individuals. They investigated the potential influence of anxiety sensitivity, injury/illness severity and catastrophising on attentional interference. Attentional interference was defined as a performance decrement on the auditory discrimination task during electrocutaneous stimulation. Only pain catastrophising and not anxiety sensitivity or injury/illness severity was correlated with attentional interference and performance decrement. Both of these studies demonstrate the role catastrophising plays in the control of attention in the presence of potential sources of pain and the potential effects on concurrent cognitive activities and performance. The evidence from such experimental studies has also been replicated to some degree in real world settings, with many patients with chronic musculoskeletal conditions showing high levels of catastrophising, reporting frequent episodes where their pain interferes with activities of daily living. To-date, no study has investigated systematically how catastrophising may influence the attentional biases to pain in a chronic musculoskeletal pain group.

Originally, catastrophising was suggested to be a stable trait, which was considered to be a dimension of personality (Sullivan et al., 1995). Studies have shown, however, that when patients are involved in cognitive behavioural therapy, levels of catastrophising can be modified and decreased. In addition, pre- to post- treatment reductions in catastrophising are associated with

reductions in pain severity (Jensen et al., 2001). Research demonstrates that reduced levels of catastrophising are correlated with reductions in depression and increased mobility (Jensen et al., 1994). In addition, strategies to encourage early reduction in catastrophising in patients during treatment regimes have been associated with improvements in pain later in treatment compared to individuals whose catastrophising was not reduced (Spinhoven et al., 2004).

2.9.2 Self-efficacy

Functional self-efficacy is defined as an individual's confidence in their ability to be successful in a specific task (Woby, Urmston, et al., 2007). Patients with chronic musculoskeletal pain frequently present with dysfunctional beliefs, attitudes and behaviours, related to their experiences of pain. Some patients believe physical activity will aggravate their injury and they lack confidence in their ability to complete tasks associated with daily life (Stenberg et al., 2013). For most patients, a chronic musculoskeletal pain condition can affect their ability to work, or delay return to work. De Vries et al. (2013) investigated self-reported work ability and work performance in a group of individuals with non-specific, chronic musculoskeletal pain. They found that self-efficacy contributed to both an individual's ability to work and work performance. Interestingly, pain intensity and fear-avoidance beliefs did not contribute to either ability to work or work performance.

In addition, self-efficacy can have an impact on treatment outcome, and explain a significant amount of variance in disability. Within a study by Denison at al. (2004), in a primary care based chronic musculoskeletal pain group, in

addition to fear-avoidance and pain intensity, self-efficacy explained an additional 24% of the variance in disability. Self-efficacy was not initially included in the fear-avoidance model as there was a limited amount of research linking self-efficacy to fear-avoidance. More recent studies, however, have reported a strong association between self-efficacy, fear-avoidance and disability (Thompson et al., 2010; Woby, Urmston, et al., 2007). Such findings suggest that high self-efficacy may enable patients to overcome high fear-avoidance for specific tasks and potentially increase physical activity.

Cross-sectional studies have found that self-efficacy mediates the relationship between pain intensity and disability (Arnstein et al., 1999). In support of this, Costa et al. (2011) found that, over a 12-month period only improvements in self-efficacy beliefs (and not fear of movement) mediated the relationship between changes in pain and changes in disability. Suggesting the importance of interventions which aim to improve self-efficacy. Woby, Urmston et al. (2007) found that self-efficacy mediated the relationship between pain-related fear and pain intensity, and between pain-related fear and disability. These mediation effects suggest elevated pain related fear might not lead to increased pain intensity and disability when self-efficacy is high. When self-efficacy is low, increased pain related fear may lead to amplified pain intensity and disability. Miro et al. (2011) is one of only a limited number of studies to investigate the mediating role of self-efficacy and sleep dysfunction on pain intensity, anxiety, depression and daily functioning within a group of fibromyalgia patients. Although chronic pain is the primary symptom in this group, disturbed sleep is a major factor for patients with fibromyalgia. Miro et al. (2011) found that self-efficacy mediated the relationship between

pain intensity and daily functioning. Higher levels of self-efficacy were associated with less pain, emotional distress and better sleep quality and daily functioning. In addition, both self-efficacy and sleep dysfunction was found to mediate the relationship between pain and anxiety and depression, suggesting that the interpretation of pain is just as important as the pain itself (Miro et al., 2011).

Both of the previous studies (Miro et al., 2011; Woby, Urmston, et al., 2007) provide valuable insight into the role of self-efficacy in mediating factors which are considered to be important for patients suffering from chronic pain (e.g., sleep disturbance, daily functioning). The main limitation of both of these studies was their cross-sectional design, resulting in difficulty explaining the mediation of these relationships as causal. Longitudinal studies would provide a greater insight into explaining some of these relationships and should be considered for future research.

2.9.3 Depression

Depression is defined as a pervasive low mood, and loss of interest in usual activities (Bair et al., 2003; Woo, 2010). Unsurprisingly, chronic musculoskeletal pain patients tend to report more depression related symptoms than individuals within the general population without pain (Magni et al., 1993). Studies have demonstrated strong correlations between ratings of depression and reports of pain, with evidence showing that depression has an important influence on reports of daily activity impairment, irrespective of the stage of chronicity (Boersma and Linton, 2005). In addition, there are physiological similarities between the symptomology of pain and depression

(e.g., sleep disturbance, fatigue, change in appetite) and it has been suggested that they follow the same descending pathway of the central nervous system. The biochemical theory of depression proposes that depression is the result of a neurochemical imbalance of key neurotransmitters serotonin, noradrenaline and dopamine (Fields, 2000). Key brain structures involved in the modulation of pain are the periaqueductal gray and the on- off-cells in the rostral ventromedial medulla which determine negative affect and attention to peripheral systems (Bair et al., 2003). These systems supress signals coming from the body to allow more attention to be paid to external information. With deficits of serotonin and noradrenaline, as shown in depression, this system may lose its modulatory effect, leading to an amplification of pain signals and result in more attention and emotion applied to them. This may help to explain why patients with higher depression describe multiple pain symptoms and why their pain is associated with increased attention and anxiety.

A patient's level of depression plays an important role in the chronic pain experience, as patients with greater depression have been found to report higher levels of pain (Knaster et al., 2012), disability (Perry and Francis, 2012) and are generally less active (Haythornthwaite et al., 1991). Furthermore, depression has been found to be a strong predictor of the onset and future risk of chronic pain (Carroll et al., 2004; Linton, 2005). In addition, depression is a strong predictor of pain and disability, both cross-sectionally (Bair et al., 2008) and longitudinally at six and twelve months (Cherkin et al., 1996; Sieben et al., 2005). In addition, higher levels of depression pre-treatment are predictive of poorer treatment outcomes (Bair et al., 2003; Linton, 2000; McCracken and

Turk, 2002). Glombiewski et al. (2010) investigated cross-sectional and longitudinal associations of depression and chronic pain in patients taking part in cognitive-behavioural therapy. Regression analyses showed higher pre-treatment depression scores predicted higher pain intensity and disability scores at pre-treatment even after controlling for other psychological variables (e.g., fear avoidance beliefs). In addition, reductions in depression from pre- to post-treatment explained variance in the reductions in both pain intensity and disability. Woby et al. (2008) investigated a group of patients attending a physiotherapist-led intervention (Interactive Behavioural Modification Therapy (IBMT)) which was based on cognitive-behavioural principles. Pre- to post-intervention changes demonstrated reductions in disability, fear of movement, catastrophising and depression, and an increase in self-efficacy, control over pain and ability to decrease pain, however, there was no significant change in pain intensity. Changes in disability explained 28% of the variance in changes in depression. Although changes in disability were strongly related to changes in depression, this was not the case for pain intensity. Woby et al. (2008), suggested that pain intensity is indirectly related to depression via the mediating role of interference with daily activities. Although depression may not be a direct consequence of pain, there in now a general acceptance of the consequence theory, suggesting that pain precedes depression (Arnstein et al., 1999; Knaster et al., 2012). Longitudinal studies have shown that 63% of depressive disorders appeared after the onset of pain (Knaster et al., 2012).

2.9.4 Anxiety

Anxiety is defined as *"a psychophysiological state characterised by cognitive, somatic, emotional and behavioural components that produce fear and worry"* (Woo, 2010). The co-occurrence of movement-related anxiety and chronic pain is not surprising and has received substantial interest over the past 20 years. Anxiety is comprised of two separate components; state anxiety refers to the experience of feelings when confronted with specific situations, or a particular object or event and trait anxiety is the individuals predisposition to be anxious and general tendency to respond to perceived threats in the environment. The experience of anxiety involves both a mental aspect termed cognitive anxiety, or worry, and perceptions of physiological symptoms, known as somatic anxiety (Liebert and Morris, 1967; Martens et al., 1990). Cognitive anxiety is defined as *"negative expectations and cognitive concerns about a situation and potential consequences"* (Martens et al., 1990). Somatic anxiety is an individual's perception of their physiological arousal symptoms, such as heart palpitations, increased sweating, shortness of breath or muscular tension (Morris et al., 1981).

Individuals with chronic pain frequently experience anxiety about movement and may avoid activities of daily living. As a consequence, the pain symptoms linked to their condition persist. The triad of chronic pain, anxiety and depression has been found to be the leading cause of functional impairment, work related disability and lower levels of quality of life (Kroenke et al., 2013). Numerous studies have suggested that pain-related anxiety predicts how patients adapt to chronic pain and is an important component of

pain management (Kroenke et al., 2013). Bair et al. (2013) investigated whether baseline and early change (three months post-baseline) anxiety predicted 12-month reports of depression and pain severity in a general chronic musculoskeletal pain population. The authors found that anxiety at baseline predicted pain severity and depression at 12 months. Secondly, reductions in anxiety severity from baseline to three months were predictive of depression at 12 months but not pain severity. This study demonstrates the importance of anxiety as an independent predictor of depression and pain severity at 12 months, and that reductions in anxiety will influence levels of depression. The findings have important implications for treatment, since interventions that lessen anxiety symptoms may relieve depression and pain. Particularly in patients whose pain or depression are not improving with treatment.

Cognitive factors, such as a patient's attention to physical stimuli or inappropriate attributions as to the cause of their pain, may play a role in increasing the pain experience (McCracken, 1997). Clinical studies have shown that patients scoring high on pain-related anxiety also report high levels of attention to pain sensations (Arntz et al., 1991) and tend to over-predict the amount of pain they are likely to experience. Differences in attention to pain symptoms have also been found between high and low trait anxious individuals. McCracken et al. (1993) investigated predictions of pain intensity, reports of pain-related anxiety symptoms and range of motion during passive straight leg raising in high and low-anxious participants suffering from chronic back pain. Participants were asked to rate the intensity of pain they expected to experience on a leg raise, then after the task they were asked to rate, the

actual level of pain and anxiety they experienced. Interestingly, high-anxious individuals tend to initially over-predict their rating of pain and reported higher pain related anxiety, whereas, low-anxious individuals under-predicted their pain. Heightened pain-related anxiety may produce an increased vigilance to somatic symptoms (e.g., sweating, increased heart rate) in high-anxious individuals linked to possible pain, causing them to over-predict the intensity of pain they will experience (Eysenck, 1997). Higher predictions of pain severity were also related to a lower range of motion. McCracken et al. (1993) suggested that individuals who expect more pain, terminate the leg raise earlier as a result of the fear and anxiety, than those who expect less pain. These anxiety-based differences in the anticipation of pain are of particular interest to clinicians when developing pain management programmes, which could include trait anxiety differences.

2.10 Personality type

Researchers have been investigating individual differences relating to personality for decades. McCrae and Costa (1985) identified the following five, core personality traits: extraversion; agreeableness; conscientiousness; neuroticism; and openness. One of these 'big five' factors, neuroticism, has shown consistently strong correlations with measures of trait anxiety (Eysenck, 1997). Questionnaire measures assessing neuroticism and trait anxiety typically show correlations of between 0.68 and 0.70 (Watson and Clark, 1984; Flett et al., 1989). Trait anxiety is considered to be an important dimension of personality and is included in most theories as a major personality factor (Digman, 1990). Other theories (Eysenck, 1992; Williams et

al., 1988) have primarily focussed on the role of the cognitive system (e.g., attentional biases) and trait anxiety when attempting to explain individual differences in the experience of potentially threatening situations.

Eysenck (1992) proposed a cognitive theory of trait anxiety based on the premise that the function of anxiety is to facilitate the early detection of impending danger in potentially threatening environments. Since it is the attentional system, which is involved in threat detection, individuals high and low in trait anxiety should differ in terms of their pre-attentive and attentional functioning. Eysenck proposed that variations in trait anxiety are reflected in a range of 'cognitive biases', which influence processing of ambiguous or threat-related stimuli. These biases include a selective attentional bias, interpretive bias, and negative memory bias. It was also assumed that these biases are more evident when situational (e.g., state) anxiety is high. High-anxious individuals are predicted to selectively attend to threat-related stimuli rather than neutral stimuli. They are also more likely to interpret ambiguous stimuli as threatening and show a negative memory recall bias in explicit memory. Thus, they are significantly more likely to remember more threat-related than non-threatening events of both a social (e.g., social rejection) and physical (e.g., physical wounds) nature (Eysenck, 1992). Attentional biases have been implicated in both the cause and maintenance of emotional disorders and can cause the exacerbation of anxiety (Koster et al., 2010). Of particular interest to the current research, is the finding that, an attentional bias to pain related symptoms in chronic pain populations may lead to the causation or maintenance of pain. Excessive vigilance, may be associated with pre-

occupation with pain, resulting in a tendency for patients to avoid activities which are deemed threatening to their condition (Schoth et al., 2012).

Numerous experimental paradigms have been used to investigate attentional and interpretive biases, including, the emotional Stroop task (Stroop, 1935), the dot probe task (MacLeod et al., 1986), the spatial cueing task (Posner et al., 1978) and the visual search task. In recent years, there has also been an increase in the use of eye-tracking technology in conjunction with these experimental paradigms. Studies investigating cognitive biases have primarily used either the dot probe paradigm or the Stroop test.

The emotional Stroop task presents emotional or threatening stimuli (typically words) to participants in different colours. Participants are required to colour name each stimulus as quickly as possible while ignoring the actual meaning of the word. Performance times on emotional trials are often compared to trials with non-emotional or neutral stimuli (Epp et al., 2012). Slower response times to colour naming in emotional over the neutral stimuli are suggested to reflect an attentional bias towards threating stimuli. The emotional Stroop task was initially the most widely used paradigm to investigate threat-related attentional biases, however, it has provided mixed results in patient populations. Some studies have found evidence of a specific pain-related bias in patients with chronic pain compared to healthy controls (Snider et al., 2000), whereas others have reported no bias (Asmundson, Wright, et al., 2005; Pincus et al., 1998) or found a bias to some but not all pain related words (Crombez et al., 2000). In a meta-analysis of data from five studies using the Stroop paradigm, Roelofs et al. (2002) identified significant mean differences from both sensory and affective pain words, indicating

chronic pain patients attend to pain stimuli significantly more than healthy controls. Given the limited number of studies and the conflicting findings, the authors recommended that a more robust test (e.g., the dot probe paradigm) should be used in future studies to assess attentional biases in pain patients.

MacLeod et al. (1986) designed a computer based dot probe task, where, following an initial fixation point, two stimuli (one emotional and one neutral) are presented (for between 100ms to 2000ms) on the screen (either above or below, or to the left or right of the fixation point). Studies have also varied in using either pictorial or word stimuli, however, researchers often consider pictorial stimuli to be more ecologically valid and have greater meaning to the individual (Dear et al., 2011). After initial exposure, the two stimuli are then removed and a visual probe (e.g., a dot, either : or ..) replaces one of the stimuli. Participants are required to indicate the type or location of the dot as quickly and accurately as possible using either a keyboard or response keys. Congruent trials feature the probe replacing the emotional stimulus and in incongruent trials the probe replaces the neutral stimulus. Faster response times to a probe location are assumed to reflect the focus of visual attention. Averaged response times are calculated for congruent and incongruent trials and then converted into an index of attentional bias with shorter reaction times to congruent trials reflecting an attentional bias to threatening stimuli.

Research using the dot probe paradigm within both general and chronic pain populations has investigated the time-course of the bias, focussing on both the orienting and maintenance of attention in individuals with chronic pain and healthy control participants (Asmundson, Carleton, et al., 2005; Khatibi et

al., 2009; Roelofs et al., 2005). Evidence of attentional biases towards threatening stimuli in chronic pain patients has been consistently demonstrated with the use of the dot probe task using pictures rather than words (Dehghani et al., 2003; Hou et al., 2008; Schoth and Liossi, 2010). A general limitation of the findings from such studies is that the evidence of attentional bias towards threat is drawn from only a 'snapshot' of visual attention at stimulus offset and at the exposure duration used (Mogg and Bradley, 2005). This limitation has recently been addressed by the use of eye-tracking equipment which allows the researcher to record the number and location of visual fixations and gaze duration across trials thus providing insight into the temporal aspects of the distribution of visual attention (Derakshan et al., 2009). This said, previous research has found a concordance between the attentional bias shown from probe reaction time data (500ms) and the initial shift in gaze towards emotional stimuli (Bradley et al., 2000).

According to Beck's Schema Theory (Beck et al., 1985), high-anxious individuals have a dysfunctional schema relating to personal harm or threat, resulting in an increased propensity to be distracted by or attend to threat related stimuli. In particular, this bias may be enhanced when state anxiety is high or when the threat is more personally relevant. The majority of research suggests that high-anxious individuals will demonstrate an attentional bias towards threatening information (Mogg and Bradley, 1998). The results suggest that high-anxious individuals have a bias in the processing of threat which facilitates processing of negatively-valenced information over pleasant or neutral stimuli (Mogg et al., 2000). Bradley et al. (1998) investigated the attentional bias of high-anxious and low-anxious individuals from the general

population when they were presented with threatening, happy and neutral stimuli for varying durations. In both 500ms and 1250ms conditions, high-anxious participants were significantly more vigilant for threat and avoidant of happy faces. The low-anxious individuals, showed no bias in either condition. Following this study, Mogg and Bradley (1999) attempted to replicate their findings using the same dot probe method as in their 1998 study but with only a 500ms exposure condition. The high-anxious group showed exactly the same pattern, showing vigilance for threat over neutral faces. The low-anxious group showed a significant vigilance for happy over neutral faces. Interestingly, in the threat condition the low-anxious group showed no bias for threat or neutral faces. In contrast to these studies, Rohner (2002) found that both low and high-anxious individuals attended to angry more than happy faces when stimuli were presented for 0-1000ms. When images were presented for a longer stimulus duration (2000-3000ms) high-anxious individuals avoided threatening stimuli more than happy. Fox (2002) identified that low-anxious individuals demonstrated no bias towards fearful faces, and showed vigilance for happy faces. Koster et al. (2006) found high-anxious individuals showed an attentional avoidance of threatening images when they were presented at relatively short (i.e. 200ms and 500ms) and longer (i.e.1250ms) exposures. Interestingly, in the 500ms condition, low-anxious individuals also attended to the threatening images.

Individual differences in anxiety, and their link to variations in selective attention to threat may be of significance to the treatment and management of chronic pain. Some of the contradictory findings within high and low anxious individuals in previous studies suggest there may be an additional cognitive

mechanism causing these differences. Sub-dividing the low-anxious and high-anxious group based on measures of trait anxiety and defensiveness may provide greater insight into the attentional processes of individuals in chronic pain.

2.10.1 Weinberger et al.'s personality classifications

Differences between individuals in the tendency to experience anxiety appears an important distinction in clinical environments. Weinberger et al. (1979) originally investigated the combination of trait anxiety and defensiveness to explain differences between physiological and behavioural reports of anxiety. These differences reflected variations between individuals in the concordance of different measures of anxiety. Research showed that some individuals reported low levels of self-reported anxiety despite exhibiting elevated levels of physiological anxiety. Defensiveness is regarded as a coping behaviour which causes individuals to avoid negative affect and has been related to emotional and physical health and prevention of threat to self-esteem (Weinberger, 1990). Weinberger et al. (1979) proposed four personality profiles: high-anxious (HA); defensive high-anxious (DHA); low-anxious (LA); and repressor (REP) types. High-anxious individuals score high on trait anxiety and low on defensiveness; defensive high-anxious individuals score high on trait anxiety and defensiveness; low-anxious individuals score low on both trait anxiety and defensiveness; and repressor individuals score low on trait anxiety and high on defensiveness. The four personality profiles are believed to show different behaviours when confronted with stressful situations. Weinberger et al. (1979) reported that although repressors report low levels of distress, their

physiological anxiety is similar to individuals who have high-anxiety profiles (Fahrenberg, 1992; Gudjonsson, 1981). In contrast, low-anxious individuals do not appear to show any differences between their self-report measures and physiological measures of anxiety. Weinberger (1990) conducted an extensive review of the repressive personality type and concluded that repressors do not deliberately report low levels of anxiety in order to be considered more socially desirable, but because they genuinely believe they are not experiencing negative affect. These findings suggest cognitive factors such as defensiveness can moderate anxiety responses and thus may also influence pain responses.

2.10.2 Eysenck's Four-factor Theory

Following Eysenck's (1992) theory of trait anxiety, he later (1997) proposed the Four-factor Theory. The Theory suggests that the emotional experience of anxiety depends on the processing of four different sources of information (Figure 2.3). One source is related directly to the cognitive appraisal of the degree of threat presented by a situation. Eysenck (1997) argued that this was the most important determinant of anxiety; the other three sources of information depend indirectly on the cognitive appraisal of the situation. These are: the individual's interpretation of (i) their physiological activity; (ii) their prevailing action tendencies and behaviour; and (iii) the individual's own cognitions and pattern of thought (e.g., worry about the future).

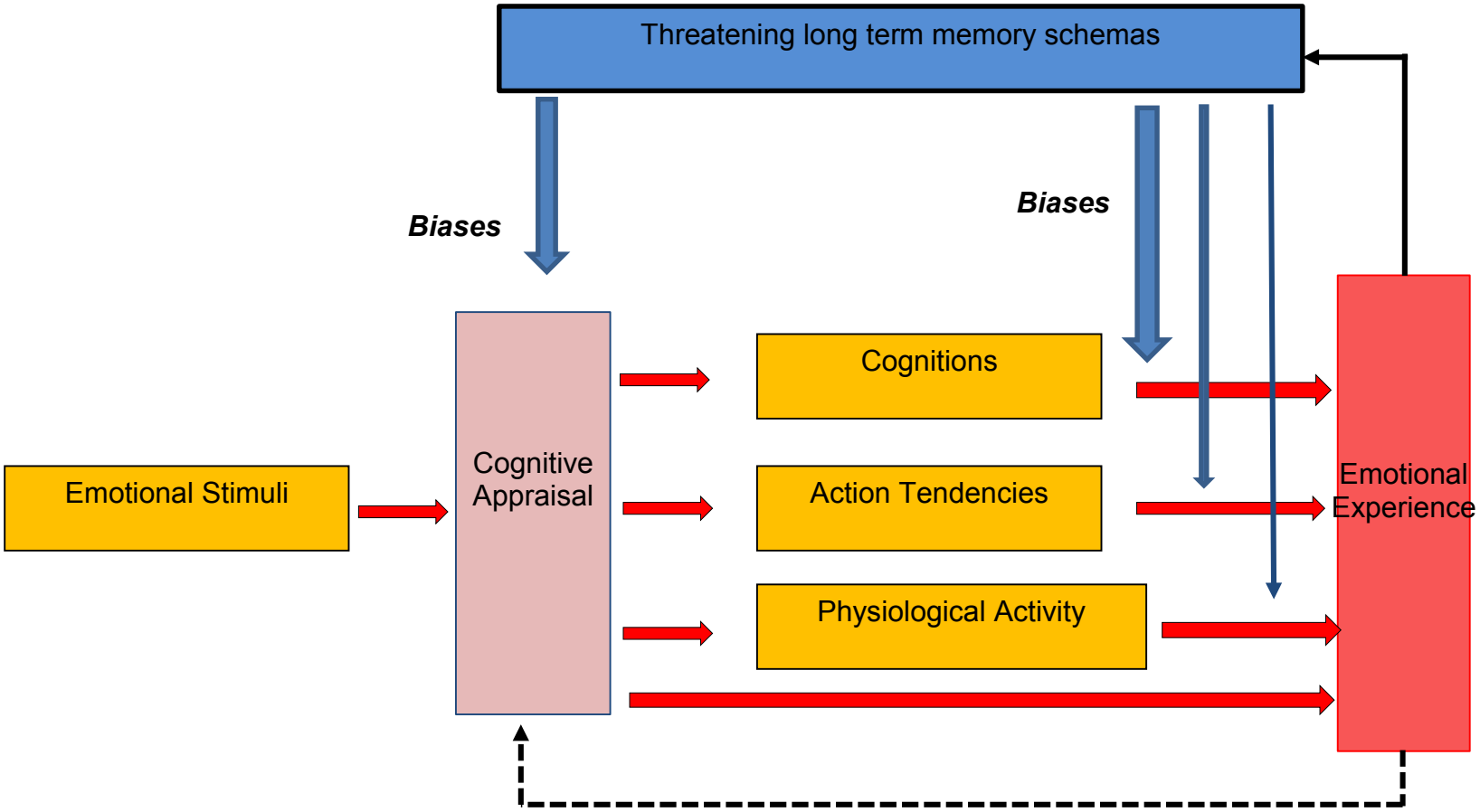

Figure 2.3. Eysenck's Four-factor Theory of anxiety.

The level of physiological anxiety is influenced by the cognitive appraisal of the situation. The impact of this physiological reaction to the experience of anxiety depends on two types of cognitive process: (i) selective attention either toward or away from the physiological activity (attentional bias); and (ii) the interpretation of the physical activity as either threatening or non-threatening (interpretive bias). In relation to selective attentional bias, studies have shown that attention to pain (which may be perceived as threatening) increases the pain experience and distraction from the pain reduces it (Arntz et al., 1991).

Studies investigating group differences in cognitive biases have primarily focussed on high-anxious individuals and repressors with respect to the four sources of information. In some studies, low-anxious individuals are not distinguished from repressors due to the self-report measures used. Similarly, high-anxious individuals are not always differentiated based on their levels of defensiveness, which has provided some inconsistent findings (Eysenck et al., 1987; MacLeod and Mathews, 1988). Eysenck (1997) proposed that the four personality groups differ in dispositional anxiety as a result of their cognitive biases, which lead them to either magnify or minimize the four sources of information. Schemas within long-term memory are assumed to be the source of cognitive biases that operate on all four factors within this theory. High-anxious individuals are predicted to have cognitive biases leading them to be vigilant to all threatening information. High-anxious individuals also show interpretive biases which lead them to interpret ambiguous stimuli as threatening. In contrast, low-anxious individuals were assumed not to exhibit any such biases in cognition whilst repressors were

predicted to show an avoidant bias to threatening stimuli. Repressors are also suggested to have opposite interpretive bias, which leads them to interpret ambiguous stimuli as non-threatening. Eysenck (1997) did not initially predict any specific cognitive biases about defensive high-anxious individuals, however, he suggested that they would show similar cognitive bias to high-anxious individuals. This may have been due to a lack of evidence, given the relative scarcity of defensive high-anxious individuals in the normal population, but seems at odds with the proposed interactional effect of defensiveness and anxiety seen in the repressors.

Derakshan and Eysenck (1997) investigated the physiological anxiety symptoms shown by the four groups during public speaking. They subsequently asked the participants to attribute the extent to which increases in heart rate during the task reflected their level of excitement or distress. In accordance with the Four-factor Theory, high-anxious and defensive high-anxious individuals attributed the changes in heart rate to the talk being threatening, whereas repressors believed that the increased heart rate reflected excitement during the task. Derakshan and Eysenck (2001b) subsequently assessed physiological activity and self-reported anxiety within the four personality types when the focus of attention (self or other) was manipulated in a public speech task. In the self-focus condition, one of the researchers talked to the participant about the feelings and emotions they were experiencing during public speaking. In the other focus condition, the participant listened to the researcher speaking about his emotions or feelings. Both the participant's and the researcher's heart rate were measured, and the researcher's speech indicated high levels of anxiety. Immediately after each

condition, the participants rated their perceived level of physiological and behavioural anxiety, experienced anxiety and level of social performance. Repressors consistently demonstrated an opposite interpretive bias in both conditions, whereby they had the lowest level of self-reported anxiety but consistently greater physiological anxiety in all conditions. The high-anxious group were consistent with predictions that their self-reported anxiety was greater than their physiological anxiety, particularly in the self-focus condition. In contrast to their previous paper (Derakshan and Eysenck, 1997), Derakshan and Eysenck (2001b) found no significant differences between self-reported and physiological anxiety in the defensive high-anxious group. This finding suggests that the defensive high-anxious individuals differ from the high-anxious group in stressful situations, however the mechanisms behind these differences need to be investigated further.

The Four-factor Theory suggests that the four personality types also differ in their own patterns of cognition, such as worries about future events. Eysenck (Eysenck, 1997; Eysenck, 2000) suggests that these worries are normally based on autobiographic information stored in the long-term memory. Eysenck and Derakshan (1997) compared the difference between the four personality types' predictions of various positive and negative examination related events happening to them or other students in the run up to exams. Despite the finding that the actual examination result did not differ between the repressors and other three groups, repressors believed that negative examination related events were significantly less likely to happen to them than other students. In addition, the high-anxious and defensive high-anxious individuals were significantly more pessimistic and predicted they would

achieve a worse score than they actually did, they also predicted significantly more negative outcomes for themselves than for others. In terms of examination worry, the high-anxious group and defensive high-anxious group differed. High-anxious individuals reported worrying significantly more than their friends, whereas defensive high-anxious individuals didn't report any differences. The varying results for defensive high-anxious individuals suggest that their defensive coping style is partially successful, as they do not spend time worrying about negative future events than others and they do not worry more intensely about those events.

Research investigating the effects of trait anxiety and defensiveness on attentional biases is mixed, and primarily focuses on high-anxious, low-anxious and repressor individuals in the general population. Mogg et al. (2000) used a dot probe task to assess the attentional patterns of repressors, high-anxious and low-anxious individuals. In line with previous predictions, the repressor group demonstrated avoidance of both social threat and physical threat words relative to neutral words and the low-anxious group showed no bias. Ioannou et al. (2004) were the first group to investigate the attentional biases of all four personality groups. They used the dot probe paradigm with angry and happy faces presented for 500 and 1250ms. The high-anxious participants were more vigilant of threatening faces in the 500ms condition compared to both the low-anxious and defensive high-anxious group. Interestingly, and contrary to predictions, defensive high-anxious individuals showed an attentional bias towards happy faces relative to neutral faces. This finding may explain why the attentional bias for threat-related information in non-clinical high-anxious groups is equivocal. In addition, the repressor group

did not follow previous predictions and demonstrated no attentional bias for happy or threatening faces. Studies investigating the attentional biases of individuals within a chronic musculoskeletal condition have tested the group as a whole and not differentiated them based on anxiety or social desirability.

Further research needs to consider the combination of anxiety and defensivness when investigating attentional bias. As mentioned before, the defensive high-anxious group are often omitted from studies, therefore the role of defensiveness in the processes for selective attention have not been fully established within the literature. Within the repressor group, it has been demonstrated that the interaction of defensiveness with low trait anxiety causes individuals to avoid threatening information following initial vigilance. It would be of interest to identify whether high anxiety interacts with defensiveness to influence the attentional pattern.

2.10.3 Vigilance-avoidance Theory

The Four-factor Theory originally suggested that repressors exhibit an avoidant cognitive bias at all stages of threat-related processing. There is evidence which demonstrates that repressors tend to show physiological (Derakshan and Eysenck, 1997) and behavioural symptoms of anxiety, which suggest that the processing of threat-related information does occur at some level. Earlier work by Calvo and Eysenck (2000) investigated the time-course of interpretive biases in processing threat-related stimuli, in repressor, low-anxious and high-anxious individuals. Repressive coping was associated with facilitated early processing of threat but inhibited late processing. Whereas

high-anxious individuals sustained vigilance for threat at all three time points (50ms, 550ms, and 1050ms).

Derakshan et al. (2007) proposed the Vigilance-avoidance Theory (VAT) of anxiety that was specifically relevant for repressor individuals. The VAT suggests that when repressors experience self-relevant threat by a stimulus or situation, there are two distinct stages of processing involved. The first is the vigilance stage, which occurs rapidly and involves an automatic and non-conscious reaction. This stage also involves knowledge, which is situationally accessible and is reflected in the initial, vigilant reaction. During this rapid and early processing stage, repressors are more likely to notice self-relevant threats and exhibit both attentional and interpretive biases. Derakshan et al. (2007) suggest that repressors demonstrate vigilance to information due to self-relevant negative schemas stored in long-term memory (e.g., previous experience of low back pain due to an occupational injury). The second stage proposed by Derakshan et al. (2007) is the avoidance stage, which reflects a more consciously controlled and strategic process focused on verbally accessible knowledge linked to an avoidant coping strategy. In the context of the current research this may be reflected in repressors avoiding negative, self-relevant information such as pain. Derakshan et al. (2007) proposed that repressors use three types of cognitive biases: an avoidant attentional bias; an avoidant interpretive bias and an avoidant memory bias that can be applied to both internal (i.e., bodily) and external (i.e., environmental) stimuli. These biases are proposed to aid repressors in their avoidance of negative affect. Repressors appear to use these cognitive biases after a situation or stimulus has been identified as a threat (Brosschot et al.,

1999). They also tend to become more defensive when they perceive themselves to be under psychological or physiological self-relevant threat. Derakshan et al. (2007) predicted that the differences between psychophysiological, behavioural and self-report measures of anxiety viewed in repressors are apparent because the psychophysiological and behavioural measures are mainly dependent on the initial, vigilance stage of processing, whereas the self-report measures depend mainly on the avoidance stage (Loney et al., 2005). Within VAT, repressors are expected to demonstrate an initial attentional bias towards the threat-related stimuli, followed by an avoidance bias for the stimuli. Prasertsri et al. (2011) found that patients identified as repressors reported significantly lower levels of pain quality (e.g., the experienced sensations of pain, 'stabbing' etc.) compared to the high-anxious and defensive high-anxious groups although their pain intensity (e.g., how much pain someone is experiencing) was not significantly different. Prasertsri et al. (2011) suggested that a repressive coping style was a positive adjustment to chronic pain, as it was associated with less depression, catastrophising and pain. Therefore, these patients had initially attended to the pain and been referred to a treatment programme but then perceived themselves to have less debilitating symptoms. We would expect defensive high-anxious participants to continue to highlight their pain and interpret this as serious or threatening and thus seek different types of treatment.

2.11 Personality type and pain

There is a large body of literature investigating the repressive personality type within both the general population and chronic pain. Defensive high-anxious individuals are often excluded from studies due to low numbers. A relatively high proportion of repressors have been observed within a number of chronic illness populations, such as those with heart disease (20%) and cancer (36%) (Mund and Mitte, 2012; Myers, 2010). Although defensive high-anxious individuals are relatively few in the general population (~7-10%), Creswell and Chalder (2001) found that 46% of Chronic Fatigue Syndrome patients were classified as defensive high-anxious. Lewis, Fowler et al. (2012) also identified a high prevalence (39%) of the defensive high-anxious personality type within a group of patients with chronic back pain referred to an active rehabilitation programme. It is interesting to note the difference in repressor and defensive high-anxious numbers reported by these studies. In comparison to studies investigating chronic illness populations, e.g., heart disease, cancer (Denollet et al., 2008; Phipps and Steele, 2002), where the numbers of repressors are high, there was a relatively low number of repressors (~9%) in the populations of Chronic Fatigue Syndrome and chronic back pain. A potential explanation for this difference is the recruitment of participants with a pathologically determined illness and those with a more insidious and non-specific condition. It could be speculated that individuals who are defensive high-anxious are more likely to interpret their pain in a negative manner and thus present for treatment than repressors. With chronic back pain or Chronic Fatigue Syndrome, repressors may be able to avoid their pain and self-manage treatment, an option not available for conditions with a more clearly defined

biomedical diagnosis and treatment pathway. Phipps and Steele (2002) investigated the prevalence of repressors within a population of children with chronic illness (e.g., cancer, juvenile rheumatoid disorders, diabetes mellitus and cystic fibrosis). They found that repressors showed a reluctance to seek social support and engage effectively in psychotherapy. This evidence supports the notion that repressors are more likely to wish to self-manage their condition, as they perceive the associated threat of the condition more positively (Eysenck, 2000; Myers, 2010). In addition, they tend to be overly optimistic about their future performance or treatment outcome (Franklin et al., 2015; Jones et al., 2004) and may be more likely to report a negative association with any treatment they receive.

2.12 Summary

Chronic pain clearly has significant, widespread consequences for the pain sufferer, their family and the wider economy. Nationally, there are guidelines for referral into PMPs, which aim to provide individuals with strategies to cope with their pain and reduce use of healthcare services. There are still a significant number of patients who continue to utilise healthcare services after attendance at PMPs (Jensen et al., 2005; Thomsen et al., 2002).

It is clear that psychological factors such as kinesiophobia, catastrophising, self-efficacy and depression play an important role in the development and maintenance of chronic musculoskeletal pain. All of these factors are widely recognised as important predictors of clinical outcome (Linton, 2000). High trait anxious patients are more likely to attend to threatening stimuli (e.g., their pain intensity) which can increase the

individual's perception of negative affect (e.g., catastrophising). Leading to the individual reporting higher disability and being more likely to seek ongoing treatment.

Over the past 30 years there has been substantial research exploring the repressive personality type as they make up approximately 40% of certain populations and are considered an essential group for health psychologists to study (Myers, 2010). Repressors may be better at coping with health behaviours that are perceived to be under their control compared to defensive high-anxious individuals. Considering the defensive high-anxious group account for up to 46% of a chronic musculoskeletal pain population it would seem necessary to understand more about how they interpret and respond to chronic pain. High defensiveness may be a contributory factor in patient persistence in the care system. To-date, there is a paucity of research that has looked at personality types in chronic musculoskeletal pain. The limited evidence available from the clinical environment provides a *prima facia* case that personality type interacts with various psychological factors known to influence clinical outcome. Identifying the mechanisms involved may provide a foundation for targeted interventions to improve clinical outcome.

2.13 Aims

Global aim: To determine whether the management of chronic pain would be enhanced through the use of treatment stratified based on personality type.

Research aim: To establish if personality type influences clinical outcome in individuals with chronic pain and the mechanisms by which anxiety and defensiveness interact to influence pain and disability.

Objectives:

1) to identify the key factors that influence patient satisfaction in the management of chronic pain;
2) to establish the attentional biases of defensive high-anxious individuals to threatening stimuli in a chronic back pain population;
3) to identify whether there are differences in the distribution of personality type between those with and without chronic pain;
4) to determine whether personality type affects the relationships between cognitive factors and both pain and disability.
5) to identify whether there are any differences between personality types in the minimally clinical important change from baseline to three and six months for pain and disability.

CHAPTER 3

3.0 General method

3.1 Design structure

The purpose of this programme of research is to investigate whether the interaction between anxiety and defensiveness (personality type) can help to explain the responses of individuals with chronic pain. The studies within this thesis have adopted a mixed methods approach, to help understand the complex relationship between personality type, psychological factors and treatment outcome. The thesis comprises a questionnaire study with both cross-sectional and longitudinal analyses and two further studies to explore issues arising from these studies. The first objective, to identify the key factors that influence patient satisfaction in the management of chronic pain, is addressed through interviews with a cross-section of patients (Study 1) to provide insight and understanding of the patient population and the factors important to them in order to enhance the discussion of the quantitative findings.

Within the current literature, there is an absence of a clear hypothesis as to the attentional biases evident in defensive high-anxious individuals. In order to provide insight into the mechanisms underlying the responses observed in the questionnaire data within this thesis it was necessary to explore the attentional biases of defensive high-anxious individuals. In relation to the second objective a dot probe study was employed to determine the nature of attentional biases for the different personality types with in a group of patients with chronic pain (Study 2). The outcomes from this study fill a critical void in the body of knowledge relating to personality type.

In relation to the third objective, identifying whether there are differences in the distribution of personality type between those with and without chronic pain, a cross-sectional questionnaire design is employed to identify the distribution of personality types in a population of patients with chronic pain and to contrast this with that seen in asymptomatic individuals (Study 3). This study was conducted to establish whether the greater prevalence of defensive high-anxious individuals in clinical populations, observed by Lewis et al. (2012) and Cresswell and Chalder (2001), was substantiated for those within general pain management. In relation to the fourth objective, to determine whether personality type affects the relationships between cognitive factors and both pain and disability*;* the cross-sectional questionnaire data were further analysed to identify whether personality type influenced the relationships between cognitive factors and disability in the chronic pain group. Furthermore, patients were tracked over a 12 month period to determine whether changes in pain, disability and satisfaction were influenced by personality type (Study 4). Patients initially utilised in the cross-sectional study were contacted at three further points throughout a year (three, six, and 12 months after first sample). Changes in key outcome measures as well as any differences in relationships between cognitive factors were examined at each time point. In relation to the fifth objective, to identify whether there are any differences between personality types in the minimally clinical important change (MCIC) from baseline to three and six months for pain and disability, the longitudinal disability and pain intensity data were further analysed to investigate these differences between the personality types over time (Study 4).

Ethical approval was granted by The Proportionate Review Sub-committee of the National Research Ethics Service (NRES) Committee North East - Newcastle and North Tyneside 2 for studies 1,3, and 4 and by the NRES Committee North West - Greater Manchester Central for study 2. All studies within this thesis also received ethical approval from the Exercise and Sport Science Departmental Ethics Committee of Manchester Metropolitan University.

3.2 Patient population

All studies involved NHS patients who had been referred to a hospital for pain management. Six hospitals were initially recruited into the study (Table 3.1), however, only the patients from five hospitals responded to the questionnaires. The duration of pain ranged from three months to 20 years, and all patients were suffering from a chronic musculoskeletal pain condition (e.g., chronic back pain, fibromyalgia, arthritis chronic fatigue syndrome). As there is no defining start point for the onset of chronic pain, participants were recruited at their first appointment with the clinician at their current treating hospital, rather than a particular point in their pain journey (Study 1, 3 and 4). NHS patients were recruited by asking clinicians to distribute to all new patients information packs containing a participation information sheet, invitation letter, return envelope and informed consent form (Appendix 1). If patients opted to take part, they were asked to return the informed consent form along with their contact details in the return envelope. Once patients had opted in, they were sent the first questionnaire with a return envelope. Participants were asked to complete a set of validated questionnaires at baseline (first contact with the

clinician), three, six and 12 months after they were recruited into the study. If the participant did not return a questionnaire, they were sent one reminder pack and were then assumed to have withdrawn from the study. Participants were only sent the next questionnaire pack if they had completed the previous one.

Table 3.1 Number and response rate of patients to the first questionnaire from the six participating hospitals.

Hospital	**Number of patients interested in the study**	**Number of individuals completed the first questionnaire**	**Response rate (%)**
Pennine Acute Hospital Manchester	41	33	80
Frimley Park Hospital	32	24	75
Stockport Hospital	26	19	73
Robert Jones and Agnes Hunt Hospital, Oswestry	6	3	50
Kings college London	1	0	0
Lewisham Healthcare Trust	0	0	0
Total	106	79	74

3.3 Asymptomatic population (Study 3)

Asymptomatic individuals were recruited using a 'buddy referral system' and contacts within the general public for the questionnaire part of the study. The 'buddy referral system' involved asking individuals within the chronic pain population to ask a friend of a similar age and sex to take part in the study. Participants were excluded if they had, at any time, experienced a recurring chronic pain condition or if they had been referred to a chronic pain clinic. Participants filled in the same questionnaires as individuals who have chronic pain, with the exception of the pain intensity and treatment satisfaction questions.

3.4 Measures

Appendix 3 contains copies of each of the validated questionnaires used within this study. A self-report item was considered incomplete if three or more scale items were missing. Participants completed all questionnaires at each time point, with the exception of the satisfaction questions, which were only asked at three, six and 12 months.

3.4.1 a) Defensiveness

The 10-item short form of the Marlowe-Crowne Social Desirability Scale (MC-SDS) (Strahan and Gerbasi, 1972) was used to assess defensiveness and to discriminate defensive high-anxious from high-anxious individuals. The scale consists of items that are culturally approved but unlikely to occur. A correlation coefficient of $r = 0.9$ ($p < 0.001$) has been reported between the 10

item MC-SDS and the original 33 item MC-SDS (Crowne and Marlowe, 1960) with an internal consistency of α= 0.66 (Reynolds, 1982).

3.4.1 b) Trait anxiety

The trait sub-scale of the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983) was used to assess trait-anxiety. The scale consists of 20 statements (e.g., “I lack self-confidence”) that participants rate on a scale of 1 (not at all) to 4 (very much so), with a score range of 20 to 80. The trait component of the STAI has a test-retest reliability of between α=0.73 and 0.86 (Spielberger et al., 1983).

3.4.1 c) Personality type

Studies have differed over time on the method for defining the cut offs of the four groups. Some studies use median splits, which has the benefit of including all of the recruited population, however, the location of the medial cut-off are skewed by the data spread in the population, making comparison with other studies difficult. In addition, it can lead to relatively small differences between the determined classifications. Some studies have used quartile or tertiary splits, whereby ranked data based on the specific population are used to identify the top and bottom 25% or 33% from each group. A limitation is that this method is subject to the same sampling effects as using median values, whereby the absolute values of anxiety and defensiveness would differ depending upon the sample population. Other studies have used criterion splits, where they set the scores that will be taken for high or low defensiveness and anxiety. Based on previous research within the general population (Franklin et al., 2014), personality type was assessed based on

criterion splits (Figure 3.1) on the trait subscale of the STAI (Spielberger et al., 1983) and the MC-SDS (Strahan and Gerbasi, 1972). Repressors (REP) were defined as scoring above 8 on the MC-SDS and lower than 30 on the STAI. Low-anxious (LA) individuals scored lower than 4 on the MC-SDS and lower than 30 on the STAI. Defensive high-anxious (DHA) individuals were classified as scoring above 8 on MC-SDS and above 42 on the STAI. Finally, high-anxious (HA) individuals scored lower than 4 on the MC-SDS and above 42 on the STAI. The 'non-extreme' (NE) group scored between 5-7 on the MC-SDS and 31-41 on the STAI.

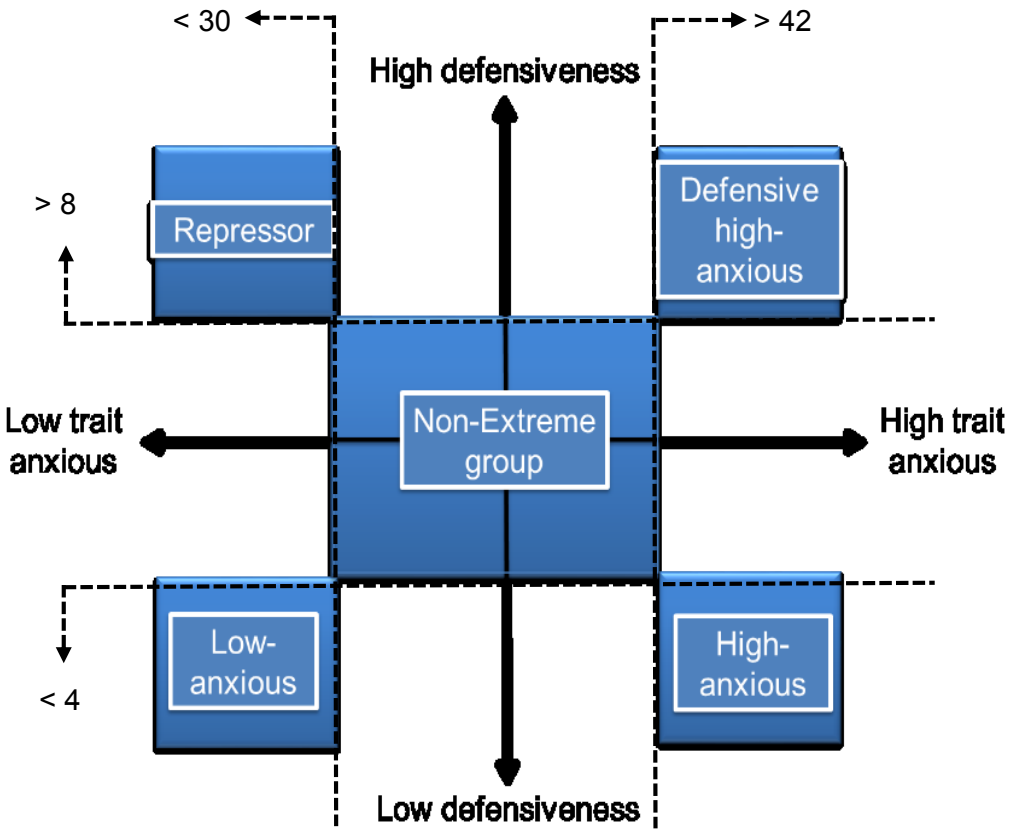

Figure 3.1. Diagram to demonstrate criterion splits of the personality types.

3.4.2 Catastrophising

The Pain Catastrophising Scale (PCS) (Sullivan et al., 1995) is a 13 item self-report measure of catastrophic thinking associated with pain. These items relate to different thoughts and feelings that individuals may experience when they are in pain. The PCS instructs participants to reflect on their painful experiences and to indicate the degree to which they experienced the 13 thoughts or feelings on a 5-point Likert scale ranging from 0- 'not at all' to 4- 'all the time'. There is an overall score of catastrophic feelings and thought and three separate subscales: (i) rumination; (ii) magnification; and (iii) helplessness. The questionnaire has high internal consistency across its factor structure, with coefficient alphas showing: total PCS= 0.87, rumination= 0.87, magnification= 0.66, and helplessness= 0.78 (Sullivan et al., 1995).

3.4.3 Depression

The Centre for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977) is a 20 item self-report measure of depression symptoms. Each item asks participants how frequently a specific symptom was experienced in the past week (e.g., I did not feel like eating: my appetite was poor) ranging from 0 (not even one day) to 3 (daily). Scores range from 0-60, the higher the score the more sever the frequency and severity of symptoms relating to depression. High internal consistency has been reported with coefficient alpha scores ranging from 0.85-0.92 (Radloff, 1977).

3.4.4 Disability

The Roland Morris Disability Questionnaire (RDQ) (Roland and Morris, 1983) is a 24 item self-report measure where participants answer either 'true' or 'false' to each statement about how they are feeling today (e.g., "I stay at home most of the time because of my pain"). Scores range from 0 to 24, with higher scores reflecting greater disability. This measure has an excellent level of reliability with a correlation coefficient of 0.91 (Roland and Morris, 1983) and internal consistency of α= 0.90 (Roland and Fairbank, 2000). Researchers have made modifications to the terminology used in the questionnaire, changing a statement from "because of my back" to "because of my pain" (Jensen et al., 1992; Turner, Ersek, et al., 2005). This has made the questionnaire more suitable for a general chronic pain population rather than specifically back pain.

3.4.5 Functional self-efficacy

The Chronic Pain Self-efficacy Scale (CPSS) (Anderson et al., 1995) is a modified version of The Arthritis Self-efficacy Scale (ASE), specifically designed to measure the self-efficacy of individuals coping with chronic pain. The original CPSS has three separate sub-scales; (i) Self-efficacy for coping with symptoms (CSE); (ii) Self-efficacy for pain management (PSE); and (iii) Self-efficacy for physical function (FSE). Coefficient alphas for internal reliability were 0.88 (PSE), 0.87 (FSE) and 0.90 (CSE).

Functional self-efficacy refers to an individual's confidence in their own ability to complete daily functional tasks successfully. The purpose of including a self-efficacy questionnaire within this study was to understand how chronic

pain affected the individual's confidence in completing daily tasks. Therefore, in order to keep the questionnaire pack as short as possible, only the functional sub-scale of the questionnaire was utilised. In addition, the functional subscale of the CPSS has been identified as a significant predictor of pain intensity, daily interference due to pain and general activity level (Anderson et al., 1995). The original CPSS-FSE is scored on a ten point Likert scale with higher scores reflecting higher levels of self-efficacy. Similar to Woby et al.'s (2008) study, this study used a 9 item self-report measure where participants responded on how confident they were to perform certain tasks (e.g., "lift a 10lb box?"). With written indicators labelled as 0= Totally Unconfident, 4= Moderately Confident, and 8= Totally Confident. Scores range from 0-72, with higher scores reflecting greater self-efficacy. Woby et al. (2007) assessed the psychometric properties of this scale in a group of 111 chronic low back pain patients. They reported excellent internal consistency ($\alpha = 0.88$) and test-retest reliability over a three day period (ICC= 0.88 [CI; 0.80- 0.93]).

3.4.6 Kinesiophobia

The Tampa Scale of Kinesiophobia (TSK) (Miller et al., 1991) aims to measure fear of movement or (re)injury in individuals with pain. The original questionnaire consisted of 17 items that patients rate on a 4-point Likert scale ranging from strongly agree to strongly disagree. Woby et al. (2005) investigated the psychometric properties of the TSK and of a shorter TSK with only 11 items (TSK-11). Both items demonstrated good internal consistency (TSK: $\alpha = 0.76$; TSK-11: $\alpha = 0.79$) and test-retest reliability (TSK: ICC = 0.82; TSK-11: ICC = 0.81). Both items were responsive to change, demonstrating that they are suitable measures to be used when assessing pain-related fear

of movement. In the context of the current study, and to help keep the questionnaire pack as short as possible, the 11-item TSK was utilised.

3.4.7 Pain intensity

As this study utilised paper based and online questionnaires a numerical rating scale was used to assess pain intensity. Participants were asked to rate their pain over the past 24 hours on a scale from (0) “no pain” to (10) “worst possible pain”. Pain intensity is a subjective interpretation of the pain experience and the patient’s assignment of the value to the numerical rating scale. Methodological studies have indicated that investigating pain intensity over time has acceptable validity (Von Korff et al., 2000) and reliability of the 11-pont NRS. In addition, this scale is recommended by Initiative on Methods, Measurement, and pain assessment in Clinical Trials (IMMPACT) to assess chronic pain intensity (Dworkin et al., 2005).

3.4.8 Patient satisfaction

Participants were also asked to rate their satisfaction with treatment outcome and with treatment care on a scale ranging from (0) “not satisfied at all” to (10) “very satisfied”. Three questions were asked at the three, six and 12 month time points: 1) How would you rate your satisfaction with the treatment you have received over the last three months? 2) Reflecting on the treatment you have received over the past 3 months how satisfied are you with the improvement in your ability to cope with pain. 3) How satisfied are you with your current level of pain.

3.5 Semi-structured interviews

A subset of participants (n= 8) who took part in the questionnaire element of the study were invited to take part in semi-structured interviews to gain a qualitative understanding of the questionnaire outcomes. Approximately six months after the start of data collection a preliminary statistical analysis of the cross-sectional data was completed. Outcomes from this statistical analysis were used to form the basis of the semi-structured interviews aimed at exploring more deeply the relationships found. Interviews, used in parallel with other methods, enriched the information gained, particularly about patient preference and perception. Themes identified from patient interviews identified were triangulated with the questionnaire outcomes, to highlight potential factors associated with treatment outcome. In addition, it allowed further investigation into how personality type could affect compliance and satisfaction.

Semi-structured interviews were conducted either face-to-face (n= 2) or over the telephone (n=6) depending on patient preference. A topic guide was developed from a literature review and the aims of the study to ensure that the same general questions were covered in each interview. The interview guide (Appendix 4) used open-ended questions and the conversation was flexible and responsive to allow the interviewees to elaborate and to gain richer information of each individual's experience (Pope and Mays, 2006).

Interviews ranged in length from 35 to 65 minutes. All interviews were audio recorded with a Dictaphone and transcribed verbatim. Face-to-face interviews were conducted at the clinic the patient was attending for treatment

and telephone interviews were conducted in the participant's home. Interviewing continued until saturation was reached and there was repetition of the same issues.

3.6 Sample size

Previous research investigating the variance in pain pre- and post-treatment has demonstrated effect sizes for the decrease in pain of ~0.4 (Burns et al., 2003). Other research has shown effect sizes between anxiety and disability of ~0.5 and between defensiveness and disability of ~0.35 (Denollet, 1991). Correlations between anxiety and other psychological variables such as depression and self-efficacy are typically between 0.4 and 0.8. Based on these correlations, a power calculation using GPower, setting alpha at 0.05, power at 0.80 and effect size between 0.35 and 0.4 suggested that a sample size of between 34 and 45 participants was needed to detect a medium effect (Faul et al., 2009). Therefore, in the cross-sectional and longitudinal studies, a recruitment target of approximately 35 participants was set for each personality type.

Previous research investigating attentional bias towards pain-related information within a chronic pain group has demonstrated an effect size of 0.45. Research investigating initial attention towards pain-related information in chronic pain patients using a stimuli presentation time of 500ms has found an effect size of 0.38 (Schoth et al., 2012). Other research has found correlations between attentional bias and defensiveness of 0.43 (Mogg et al., 2000) and trait anxiety as 0.34 (Liossi et al., 2009). Based on these correlation results *a priori power* analysis demonstrated a sample size of between 26 and 39 participants

would be required to achieve power of 0.8. As within a clinical population, research has found 35-45% of individuals are DHA. To ensure there were enough defensive high-anxious individuals within the population, a recruitment target of approximately 100 participants was set for the patient population of the dot probe study (Study 2).

CHAPTER 4

4.0 Study 1: A qualitative investigation of factors that matter to individuals in the pain management process.

4.1 Introduction

There is a growing body of research investigating how patients perceive their pain. Many individuals can find it difficult to come to terms with their pain and its consequent impact on their daily life (Dewar et al., 2009). This extends not only to their ability to work, but also to complete activities of daily living (e.g., cooking, dusting, vacuuming etc.) and to interact socially with family and friends.

Patient behaviour is an important determinant of the maintenance and development of chronic pain and the resultant disability. Patients are often referred to specialist Pain Management Programmes (PMPs) if they persist in presenting their case to care providers and self-report high levels of disability. These programmes aim to change the way patients perceive their pain, to reduce threat, promote self-management and reduce the use of health care services (Vlaeyen and Morley, 2005). Although PMPs are designed to provide the individual with the skills to manage their pain at home without clinician intervention, Campbell and Guy (2007) found that their patient population re-engaged with health care services (suggesting the PMP failed). This may be because treatment did not meet patient expectations, or because they had developed an over-reliance upon healthcare services to provide them with a validation of the pain experience, which may be lacking in other areas of their life.

The majority of studies investigating PMPs have focussed on quantitative techniques to assess treatment effectiveness (Hoffman et al., 2007; Koes et al., 2006; Williams et al., 2012). It is also important to understand how patients perceive the treatment experience and what factors contribute to their expectations and satisfaction with treatment. Previous studies have identified that relationships with health professionals, therapist characteristics, clinical outcome and treatment process (Fitzpatrick, 1991; Trentman et al., 2012; Wensing et al., 1994) affect patient reports of satisfaction with treatment. Patients tend to judge these factors based on pre-conceived expectations of treatment and if the services they receive match such expectations. There are few studies that utilise qualitative methods to provide insight into patient experiences and expectations of pain management, and the impact on their daily life (Bunzli et al., 2013), and none have applied these findings to the cognitive mechanisms of personality types. Addressing the patient perspective is an essential step to enhance the relationship between patient and clinicians leading to improved treatment outcomes and satisfaction (Zanini et al., 2014).

Chronic pain is a biopsychosocial problem, with each element having a distinct influence upon the other. In order to inform the outcomes from the questionnaire studies within this thesis, it is important to understand factors that patients believe have influenced their experiences of chronic pain and their management preferences. This study was designed to give a better understanding of the patient population and the factors which are important to them. Through the use of patient interviews, the aim of this study is to identify

key factors which have influenced individuals' experiences in the management of their chronic pain.

4.2 Method

4.2.1 Participants

Participants were recruited from the wider population in this thesis based on their personality type. The whole population were categorised into personality type and participants randomly selected from each group. They were included in the study if they were 18 years of age or over, had been suffering from chronic musculoskeletal pain for more than three months, and had been referred to the hospital for a pain management programme. Participants were invited by letter to participate in an interview. Those who replied were then contacted by telephone to arrange the interview. Over a three-month period, 15 letters were sent out and eight participants volunteered to enter the study and were interviewed. It was made clear to participants at the start of the interview that their involvement would have no impact on the care they received from their treating hospital and they had the right to withdraw at any time. Demographic patient characteristics are presented in Table 4.1. Of the eight participants, six were female and two male, with a mean age of 53.8 years. All participants had some form of chronic musculoskeletal pain, with a mean pain duration of 17.3 years. All participants were either retired or unemployed due to health reasons.

Table 4.1. Participant characteristics (n= 8).

	Participant							
	1	2	3	4	5	6	7	8
Personality type	DHA	DHA	HA	HA	HA	REP	REP	REP
Age (years)	69	81	51	49	19	44	76	42
Sex	Female	Female	Male	Female	Female	Male	Female	Female
Pain duration (years)	40	20	3	4	4	10	37	21
Type of pain	Back pain and arthritis	Back pain and arthritis	Back pain	Back pain and Fibromyalgia	Chronic Fatigue Syndrome	Back pain	Back pain	Back pain
Employment status	Retired due to health reasons	Retired not due to health reasons	Unemployed - due to health reasons	Unemployed - due to health reasons	Unemployed - due to health reasons	Unemployed - due to health reasons	Retired not due to health reasons	Unemployed - due to health reasons

4.2.2 Data collection

Semi-structured interviews were conducted either face-to-face (n= 2) or over the telephone (n=6) depending on patient preference. An interview guide (Appendix 4) was developed from a literature review and the aims of the study to ensure that the same general questions were covered in each interview. The interviewer, aided by the interview guide, asked open-ended questions to explore the key factors which had influenced each individual's experiences in the management of their chronic pain. Further probe questions were asked of the participant and the conversation was flexible and responsive to allow the interviewees to elaborate on their responses and to gain richer information of each individual's experience (Pope and Mays, 2006).

The interviews each lasted 35 to 65 minutes and were audio recorded with a Dictaphone and transcribed verbatim. Face-to-face interviews were conducted at the clinic where the patient normally attended for treatment. Telephone interviews were conducted in the participant's home. Each interview continued until there was repetition of the same issues.

4.2.3 Data analysis

The steps for qualitative content analysis and interpretation were guided by the thematic analysis described by Braun and Clarke (Braun and Clarke, 2006; Guest et al., 2012). Coding and data management were facilitated using qualitative data software NVivo (version 10). The first step in the analysis involved initial familiarisation with the information by reading the transcript as a whole, then re-reading to identify the repeated pattern of thematic content. Secondly, the presence of these themes was checked across each transcript.

At this point the transcripts were read several times to confirm the meaning of the texts. Words and passages were highlighted and assigned a code. For example, passages in which a participant described how their family influences their condition were assigned the code “family support.” The third step involved identification of themes defined as a recurring set of codes or connection made between codes. This method was chosen for systematically identifying and describing features of the data which recur across participants (Marks and Yardley, 2004). The data were returned to on several occasions to define and refine the evolving themes.

Strategies to enhance analytic rigour included constant comparison of categories and themes between the interviews and discussion of the emerging themes by the research team to ensure they were comprehensive and inclusive. To eliminate bias, two of the researchers met regularly to verify the data and reach a consensus. There were no differences in the themes to emerge from the interviews conducted face-to-face in the clinical environment and those from the home-based telephone interviews.

4.3 Findings

The analysis of the interviews provided three primary themes for the participants’ perspective of the chronic pain management process.

(i) Impact on daily life.

This theme relates to how chronic pain affected their lives on a day to day basis, subthemes include the emotional and mental impact and physical effects.

(ii) Clinical interactions.

This theme related to factors about the patient's experience with the clinicians throughout the process, subthemes included communication, explanation and understanding.

(iii) Management process.

This theme relates to positive and negative factors, which influenced their management process, subthemes included involvement, understanding, outcome and follow-up.

4.3.1 Impact on daily life

Participants reported a wide range of emotional and physical factors which influenced daily life as a result of their chronic pain. Generally, participants found that chronic pain changed their daily life significantly, more specifically, there were tasks and activities that they were no longer able to complete. Participants described how the physical impact of pain affected their daily lives, particularly, poor mobility, lack of sleep, fatigue, and difficulty standing or sitting. All of these factors made participants feel as though they had lost their independence, as others had to perform basic tasks for them.

> "… I used to be active all the time… I know it sounds stupid, but I can't just get on and do things, like house cleaning, so my Mrs. has to do it all for me, and I really hate that because ya know if I see dust up on the top of the door frame, I would normally just sort it out." *[participant 3]*

> "my parents have to miss work to take me to an appointment." *[participant 5]*

The temporality of the pain experience is also important to the participants. Participants reported that mornings were the most difficult period of the day because of the amount of time it took each participant to get ready in the morning varied, and was often dependent on the amount of sleep the night before. Depending on how they felt in the morning and how long it took to get ready, would then have an effect on the rest of the day.

> "… something that does really annoy me is that they don't listen to what I say about what time of day I want my appointments because the tablets really knock me out and it makes it difficult in the mornings for me to get up in time … they make an appointment for half eight in the morning which just doesn't help." *[participant 6]*

The temporality of the pain experience is further highlighted through participants reporting that they had to carefully plan the day and ensure that they paced themselves in order to reduce the amount of pain experienced. Participants also reported that if their pain was not managed they could end up in a vicious cycle of high pain, tension and doing too much. Using the coping strategies they learnt at the treatment sessions helped them avoid relapses and gave more consistency to daily life.

> "… you have some good days and then you try and get everything done that you're trying to catch up on and then you wonder why you're in bed for a week afterwards because you can't move." *[participant 4]*

> "… they've sort of said, right well on a good day, stand, say …for 10 minutes but on a bad day you can stand for 3, on a good day stand for 3 minutes and then sit back down again and then you don't have such a lull in the ups and downs, and you have quicker, hopefully quicker recovery times." *[participant 7]*

In addition to physical effects, participants reported a significant impact on emotional and mental aspects, such as feelings of depression, lack of self-confidence and negative mood. Participants commented on how these physical and mental aspects all contributed to the extent that pain affected their life if they were unable to control it or implement effective coping strategies.

> "You can cope with it [the pain] a lot better if it's managed. You will never get rid of it but if it's managed you can have a reasonably normal life. But if it's not, it basically puts a full stop on it" *[participant 8]*

> "I mean it is depressing, because it affects the quality of your life always." *[participant 2]*

Some participants commented on feeling a sense of isolation and that they were under-valued due to their pain and inability to do certain tasks. A particular source of conflict was when patients thought that there was a lack of understanding by family and friends. They reported feeling that others thought they were 'making it up' and it was 'all in their head', invalidating the pain experience.

> "because you feel very, very alone, very alone, especially when you've got people in your family who don't understand and don't care and just make life really, really difficult." *[participant 4]*

Although the amount of family support varied between participants, they all commented that this was an important factor for them and it significantly affected their lives, either positively or negatively. The participants reported that their mood was often affected by how much pain they were in and, as a

result, this tended to impact their social interactions with family and friends.

4.3.2 Clinical interactions

The participants reported on a number of characteristics in relation to their experiences with clinicians and their consultation preferences. The issues reflected whether their consultants were caring/friendly, the level of communication, whether participants felt they were taken seriously about their condition and the clinician's understanding of the impact of the pain. Generally, participants liked their clinician to have a caring and friendly attitude, which gave them more confidence in the clinician's suggestions.

> "I liked it because they were all so friendly and so nice and so caring and you know it was lovely." *[participant 1]*

Participants were more trusting and more likely to adhere to the self-management suggestions of clinicians they felt were interested in them and listened to what they had to say. Some participants, however, felt like they had to pester the clinician for an appointment or more information and that their condition was not being taken seriously. They felt at some stages of the treatment process they were passed around to different practitioners, which led to miscommunication as patients felt their treatment was not progressing. The participants understood the time restrictions that clinicians were under, however, they often felt like the treatment sessions were too short and they had to push them for answers and be assertive in order to make clinicians listen to them. An important factor to the participants was to have more communication and contact with the clinician in order to help them better understand their condition and to address issues that arose.

> "I still feel like I'm getting passed off from one to another and no one is really making a decision… they've not really said what's going to happen, it just seems like we are going round in circles and I keep going back for more sessions." *[participant 8]*

Participants differed in their views of how well clinicians explained their condition and the course of treatment that needed to be undertaken. Some participants reported that when they were first diagnosed they were told the clinical name of their condition but not what the name actually meant or the consequences for rehabilitation or management. It was not until they did their own research and attended either a pain management or living with pain course that they truly understood the process of their pain and the consequences of their condition. There were three key areas that participants wanted more information about; (i) the problem itself, (ii) the treatment process, (iii) the long-term implications of the condition. The explanation of their condition also helped improve patient satisfaction with treatment. The level of explanation that participants received varied, the provision of some anatomical information was found to be useful, particularly when used in conjunction with pictures and drawings. In addition, this approach reassured participants that their pain was recognized as real and being taken seriously.

> "it hadn't really been explained, I didn't understand my condition, I had no idea how to tackle it or any insight into if it's going to get worse, if it's going to get bad, or what I can do and the course has completely changed that. I understand what my body's doing now, which I didn't before, so I understand like how it's going to behave if I do like certain things… and that was just Oh my god, so that is what's going on." *[participant 7]*

4.3.3 Management process

Participants liked to be given an outline of what was going to happen in the management process, why they were having that particular treatment and how it was going to benefit them. Some participants became pessimistic about the treatments effectiveness.

> "personally, I don't think it's going to do anything… because the last time I was at physio it didn't work." *[participant 3]*

Some participants found the treatment process very frustrating if they could not find answers for their questions, or felt as though they were just being passed from one clinician to another. They also reported difficulty with travelling to appointments, particularly if they have to rely on family and friends to take them. They understood that they had to go to the hospital to see the clinician, however, they reported frustration if, when they arrived, appointments were delayed or brief. They preferred to have more time at each session in order to allow them to find out more information and gain a better understanding of their course of treatment. In addition, they reported that there were very few follow-up sessions to assess how the condition and the treatment were progressing and if there had been any changes.

> "I would like to see someone like every 3 or 4 months or something, umm just so that they can get an update, umm because I've got a load of questions that I want to ask the specialist." *[participant 5]*

The majority of participants understood that they had a long-term condition and that they should be active in managing their pain, however, they

reported that the treatment process was often more prescriptive rather than a consultation. Participants wanted to have more involvement in planning their treatment so that it addressed their individual needs and, as a result, they felt they would be more likely to adhere to the advice. Benefits from the PMPs were widely reported as they gave patients the opportunity to talk to people who were in a similar situation to themselves. By talking with others, they were able to identify different strategies to manage their pain that others had found effective at home. In turn, this gave them more self-confidence and an empowerment to cope with their pain rather than letting it control their lives. All participants reported that the coping strategies had been a key part of their treatment process and would have liked to know about these strategies at an earlier stage of treatment.

Participants reported that their perception of outcome changed over the course of the management process. When they first sought treatment, often their main aim was to find a cure, however, the longer the condition went on and the less effective they found the treatment, their main concern was to be better able to cope and reduce the pain.

> "So I've gone from like cure/fix me to maybe, like you know, just calm it down a bit/reduce it." *[participant 2]*

It was important for participants to understand their condition as it changed their expectations of treatment outcome. Although the majority of participants reported that the intensity of their pain had not significantly improved, they felt better able to cope so that they had more mobility and as a result an improved quality of life. Improved daily life was important to all

participants, and they reported that the coping strategies they had learnt from treatment were key to helping improve their level of activity. Participants understood they had a long-term condition that could not be cured, however, they were still willing to try anything in the hope that the treatment would fix them and they could go back to their normal life:

> "You know you just have to hope that you're the lucky one and it works, but what do you do? Do you not try it because it's got a high chance it's not going to work or do you try it, on the off chance that there's a slim chance that it can like block some of the pain signals going down your legs and get you out of some of the pain, maybe off some of your medication, you've got to give it ago haven't you." *[participant 1]*

Even though prescribed medication was intended to provide relief or limit to the pain, all participants reported their dislike of them, and how important it was that they reduced their use of medication. Some participants reported that the medications worked for a while but then stopped, or were ineffective on days of greater pain. Several reported that they became allergic, and were afraid of the suggested side effects.

4.4 Discussion

This study provides insight into the complex nature of the impact of chronic pain on participants' lives and the factors they consider important in the management of their condition. This complements previous literature by providing greater richness and detail of these factors and their impact on the management process. In addition, the findings support previous research and highlight that the patients within this study are representative of the general

chronic pain population. The main themes which emerged were: (i) the impact on daily life; (ii) interactions with clinicians; and (iii) the management process.

Although chronic musculoskeletal pain itself is not life threatening, it does significantly affect the individual's quality of life. In particular, the absence of a diagnosis and effective coping strategies can lead to life changing emotional and social consequences. The complex nature of chronic pain, and the difficulty clinicians face in providing a clear diagnosis, present significant challenges, as understanding their condition is a critical step for patients to help them engage with the treatment process. Zanini et al. (2014) highlighted that enhancing the communication between patients and clinicians, by addressing factors from the patient's perspective, helps to build a more critical discussion about the treatment options, giving the patient a greater feeling of control and higher patient satisfaction. Previous research has found that having a diagnosis for their pain is important for individuals as it gives them a feeling of legitimacy for their pain. Validation of their condition, through diagnosis, can help improve their social situations and patients feel less of a burden on family and friends (Toye and Barker, 2010). Participants reported being more satisfied if their condition had been effectively described to them. Particularly if diagrams were used as this gave them a greater understanding of the pain process. Without a valid explanation for their pain, patient's belief in the linear diagnosis-treatment-cure model was disturbed, which initially caused feelings of worry, depression and anxiety about the future (Campbell and Guy, 2007). The defensive high-anxious individuals may be particularly affected by a lack of diagnosis and understanding, as this will broaden the range of ambiguous stimuli, which they may interpret as threatening. This will

in turn undermine their self-efficacy with daily tasks, thus, resulting in higher disability.

The participants in this study also reported that their expectations changed over time as they learnt more about the condition. In particular, as treatment progressed and the pain remained, they became more interested in learning coping strategies, and identified that they may have accepted the chronicity of their condition earlier if they had known more about these strategies. This is particularly important for healthcare professionals to consider incorporating some initial short-term coping strategies for daily tasks into the first assessment. Satisfaction with treatment and expectations of outcome are key areas for clinicians to consider (Verbeek et al., 2004), particularly in relation to personality type. Repressors have previously been found to be overly optimistic about the outcome from threatening situations (Eysenck and Derakshan, 1997). If their expectations of treatment outcome are not met, this may explain why they do not remain in the care system, as their avoidance of negative affect may cause them to believe treatment is not necessary or working. In contrast, defensive high-anxious individuals have been found to be relatively pessimistic about future events, particularly as they are more likely to attend to threatening information (e.g., their pain). If they continue to attend to their pain, this may cause them to remain within the care system, with the premise that further treatment may lead to alleviation of their pain. Studies have shown that patients who have remained in the care system expect more information, and make higher demands on the interpersonal relationship with their health care provider (Verbeek et al., 2004). Campbell and Guy (2007) suggested that the reason some patients re-present is that

they are unwilling to accept the prospect of living with pain without some form of input from clinicians. It could be suggested that patients who re-present for treatment (e.g., defensive high-anxious individuals) become attached to the support from the clinician. In relation to Attachment Theory, Ainsworth and Bowlby (1991) suggested that threats to the availability and responsiveness of an attachment figure can produce dysfunctional emotional reactions. This could lead to an increased attention to threatening information, which in turn reduces self-efficacy with particular tasks. These emotional reactions may cause individuals to report higher levels of disability and fear of movement (Kobak, 1999), and therefore, be more likely to enter back into the care system. In addition, clinicians have commented that some patients may not have a willingness to self-manage and that the concept of accepting their condition is long term and a readiness to change is necessary before their behaviours will change (Gordon et al., 2015).

Participants reported how beneficial it was for them to talk to other patients about their pain and to discuss coping strategies with individuals in a similar situation. This gave participants the opportunity to have social interactions with people who would take them seriously and listen to their concerns about their condition as well as learning new strategies. Such inter-patient sharing of experience and social interaction may offer an effective means to engage with groups of patients and facilitate more self / group help based approaches. In so doing, it may be possible to facilitate greater opportunity for patients to discuss and learn about their condition without increasing the clinical resource demands of treatment.

Support from family and friends was important to how the patients coped with exacerbations in their pain. Those who felt their family and friends understood the condition and how it impacted upon their ability to complete tasks found it easier to be more active and felt less isolated. On the other hand, those who had little or no family support reported feeling very lonely and as though they were not needed for anything anymore. This feeling of loneliness was more likely to be associated with participants becoming less active and social, a loss of self-confidence and increased levels of depression. Previous research has found that cognitive behavioural treatments which include an education element for family are more effective at reducing pain severity and increasing activity (Radojevic et al., 1993). Within this study, when family members had a better understanding of the patient's condition, and the variability in function and experienced pain, patients felt more supported and better able to manage their condition. Despite this, participant's also reported a loss of independence with daily activities, which was evidenced through reliance on family members to complete daily tasks, and a role reversal with their children. In line with the findings in this study, previous research has identified a significant impact on the social and family roles for patients. Patients experience significant reductions in parenting, participation in family and social leisure activities, and role reversal (e.g., children taking their parents food shopping) (Strunin and Boden, 2004). These factors have also been associated with anxiety and worry about how the individual's pain affects their family (De Souza and Frank, 2011). It is suggested that limitations in fulfilling normal family roles intensifies negative affect, and frustration of role limitations was evidenced in this study. This highlights the necessity for PMPs

to include an educational element for family members, as they may be unaware of the impact they have on the pain-affected individual. The provision of clear information about the pain process, not only to the patient but also to their immediate support networks, was vital to ensuring successful management.

PMPs are designed to educate patients about their pain and to help them set goals which will improve the areas of their lives where pain has a significant negative impact. There is good evidence for the efficacy of PMPs (Hoffman et al., 2007; Koes et al., 2006; Williams et al., 2012), however, limited research has looked at the impact for patients after treatment. Whilst patients reported enjoying the social interactions associated with attendance on a PMP, they also indicated that at the end of the management programme they went back to a feeling of isolation. Attendance at a PMP gave participants something to look forward to each week, not only to have social interactions with people but also to feel involved in their pain management in an active way. This finding highlights the need to support follow-up sessions, which encourage individuals to be more socially active and rely less on support from the clinician. This suggestion is contrary to the aims of most programmes or guidelines which is to promote more self-management, however, it may lead to individuals utilising less clinical appointments and lead to greater independence.

Failure to understand their condition and how best to self-manage their pain led many participants to report, in the early stages of their management, that they were often over-doing it because they were trying to catch-up on

tasks on their better days. This increased the likelihood of a relapse, and participants found they would then feel worse for the next couple of days, both physically and mentally. In some cases, participants reported that this negative reaction to activity left them worried and fearful of future activity, causing them to avoid tasks due to lower self-efficacy, thereby leading to higher disability. This is typical of the fear-avoidance model described elsewhere in the literature (Vlaeyen et al., 1995). Previous studies, which have investigated patients with high levels of disability and fear avoidance, have identified that modifying attention can serve to reduce attentional biases to threatening information (Sharpe et al., 2012). Repressors have been shown to avoid negative affect and are good at self-managing pain when they perceive it to be under their control (Myers et al., 2005). In contrast, limited research has investigated the attentional biases of defensive high-anxious individuals, who have previously been found to make up 30-40% of the chronic pain population (Creswell and Chalder, 2001; Lewis, Fowler, et al., 2012). Investigating the attentional biases of this group may allow more targeted interventions to prevent the likelihood of a relapse and re-presentation.

CHAPTER 5

5.0 Study 2: Personality type influences attentional bias in individuals with chronic back pain.

5.1 Introduction

Theories of attention and pain predict that individuals with chronic pain will display attentional biases towards pain-related information (Schoth et al., 2012). An attentional bias can be considered as a selective attention towards or away from a stimulus which is both specific and salient to the current environment. Attentional biases have been investigated in populations with anxiety disorders (Waechter et al., 2014), depression (Donaldson et al., 2007), chronic headache (Schoth and Liossi, 2010) and other clinical groups (Hou et al., 2008; Schoth et al., 2013) and they may have important therapeutic implications for the patient and therapist. Excessive vigilance towards pain-related perceptual cues may be associated with a preoccupation with pain and lead to patients avoiding activities perceived as threatening. This behaviour may inhibit compliance with rehabilitation regimes and the development of a fear of movement and increased anxiety. Studies investigating the attentional biases of individuals with a chronic musculoskeletal condition have tended to test the population as a whole and not as differentiated groups based on variations in anxiety (Crombez et al., 2004; Crombez, Van Ryckeghem, et al., 2013; Dehghani et al., 2003; Hou et al., 2008; Roelofs et al., 2005; Schoth and Liossi, 2010). This may be important since individual differences in attentional bias underlie vulnerability to clinical anxiety and vigilance for pain-related symptoms (Williams et al., 1997).

Within chronic pain patients, anxiety has been shown to be important in the development of pain and the associated disability. Eysenck (1997) has theorised that the subjective experience of anxiety is influenced by four sources of information: (i) the cognitive appraisal of the situation; (ii) the negative cognitions that arise about possible, future events (e.g. worries); (iii) the individual's interpretation of their own behaviour; and (iv) the attention to and interpretation of the individual's physiological activity. There are two main assumptions within this theory that serve to influence the processing of the four sources of information. First, individual differences in trait anxiety and defensiveness affect the operation of attentional and interpretive biases that serve to either magnify or minimize the processing of threat-related stimuli and second, the biases in cognition are affected by the prevailing level of state anxiety.

Weinberger et al. (1979) suggested that low and high-trait anxious individuals can be split into four heterogeneous groups based on their defensiveness. Low trait anxiety combined with low defensiveness reflects truly low-anxious groups, whilst those with low trait anxiety but high defensiveness are defined as repressors. High trait anxious individuals can also be divided into two groups, high trait anxiety combined with low defensiveness reflect the truly high-anxious group, and those with a combination of high trait anxiety and high defensiveness are known as defensive high-anxious individuals.

Eysenck (1997) suggested that repressors have a defensive or avoidance bias to threat that results in avoidance of negative or threatening cues. In contrast to repressors, low-anxious individuals show no cognitive bias.

Eysenck postulated that high-anxious individuals exhibit both attentional and interpretive biases that amplify potential threat and lead them to interpret ambiguous stimuli as threatening. Unfortunately, due to their relative scarcity in the general population, few studies have considered the responses of defensive high-anxious individuals separately from their high-anxious counterparts with the consequential assumption that they respond similarly to high-anxious individuals (Eysenck, 1997).

Notwithstanding the concerns for the lack of a defensive high-anxious group, there are several studies supporting Eysenck's predictions regarding attentional biases in high-anxious, low-anxious and repressors within the general population (Brosschot et al., 1999; Derakshan and Eysenck, 2001a; Derakshan and Eysenck, 2001b). There are, however, some theoretical inconsistencies in these studies. For example, Mogg et al. (2000) used a dot-probe task with word pairings to assess the attentional deployment of repressors, high-anxious and low-anxious individuals. In line with previous predictions, the repressor group demonstrated avoidance of social threat but not physical threat words. In contrast to the theory and previous research, the high-anxious group demonstrated avoidance of social threat words but showed no bias to physical threat words. These contradictory findings could be due to the use of word rather than visual image stimulus pairings. Mogg et al. (2000) were also unable to recruit sufficient defensive high-anxious participants to allow separate analysis of high-anxious individuals. Ioannou et al. (2004) were the first group to investigate the attentional biases of all four personality groups using a dot probe task with faces. Using a student population, they reported that high-anxious participants were vigilant to

threatening faces compared to both the low-anxious and defensive high-anxious groups. Contrary to predictions, defensive high-anxious individuals showed an attentional bias towards happy relative to neutral faces. In addition, the repressor group did not follow previous predictions and demonstrated no attentional bias for happy or threatening faces. The variation in the findings of these studies highlights the need for further research to consider the combination of anxiety and defensiveness when investigating the attentional biases of individuals and for the use of clinically relevant sample populations.

Due to their relative scarcity in the general population (7-10%), defensive high-anxious individuals have often been either omitted from studies (Jones et al., 2004), or combined into a single group with the high-anxious individuals (Holtgraves and Hall, 1995). In contrast, within chronic musculoskeletal pain groups (back pain and chronic fatigue syndrome) the proportion of defensive high-anxious individuals has been shown to be much higher (39-46%) (Creswell and Chalder, 2001; Lewis, Fowler, et al., 2012). Franklin et al. (2014) recently showed that defensive high-anxious individuals were more likely to utilise a variety of treatment options compared to the other three personality types; the authors suggesting that this group were likely to be more persistent within the care system and thus more likely to be referred to chronic pain management groups. Therefore, it may be helpful to identify whether defensive high-anxious individuals also show an attentional bias towards pain-related threat and are more predisposed to focus on their condition and potentially adopt maladaptive coping strategies. A better understanding of the varied attentional biases of patients from different

personality groups may help inform better targeting of pain management strategies.

The present study aims to test Eysenck's (1997) theory, in a clinical setting by examining whether the attentional biases of defensive high-anxious individuals to pain related threat stimuli differs to those in other personality groups in a population with chronic back pain. It was predicted that: (i) defensive high-anxious individuals would show an attentional bias towards back pain-related threat images and an avoidant bias to positive images; and (ii) repressor individuals would show an avoidant bias towards back pain-related threat and an attentional bias towards positive images.

5.2 Method

5.2.1 Participants

Participants were 70 volunteers (45 female) recruited from a back rehabilitation programme at an NHS Trust in the NW of England, UK and a control group of 20 asymptomatic individuals. Table 5.1 shows the demographic data for the patient and asymptomatic control groups. All participants from the back rehabilitation programme reported suffering from back pain for more than three months.

Table 5.1. Summary of the mean (±SD) demographic data for the defensive high-anxious, high-anxious, repressor, non-extreme patients and asymptomatic individuals.

	Patients				Controls
	Defensive high-anxious (n= 18)	High-anxious (n= 11)	Repressor (n= 9)	Non-extreme (n= 29)	Asymptomatic controls (n= 20)
Age (years)	50.7 (± 12.9)	42.0 (± 15.5)	54.0 (± 18.0)	50.9 (± 12.4)	36.1 (± 10.5)
Sex	12 females 6 males	9 females 2 males	5 females 4 males	19 females 9 males	9 females 11 males
Defensiveness	8.5 (± 0.7)	3.5 (± 0.6)	8.5 (± 0.7)	6.6 (± 1.4)	5.5 (± 2.1)
Trait anxiety	50.3 (± 8.4)	52.2 (± 8.9)	26.2 (± 3.4)	38.5 (± 7.6)	36.6 (± 8.6)
State anxiety	31.7 (± 8.6)	29.5 (± 6.2)	22.7 (± 3.6)	30.6 (± 8.2)	27.3 (± 7.4)

5.2.1.1 Patients

Participants were split into personality groups based on their STAI and the MC-SDS scores. Based on previous research (Franklin et al., 2014) the groups were determined according to the following criteria: (i) defensive high-anxious (DHA; n= 18), trait anxiety scores 42 and above, and defensiveness 8 and above; (ii) high-anxious (HA; n= 11), trait anxiety scores 42 and above, and defensiveness 4 and below; (iii) repressors (REP; n= 9), trait anxiety scores 30 and below, and defensiveness 8 and above; and (iv) the non-extreme individuals (n= 29) were participants who scored in the mid-range for trait anxiety and defensiveness. The low-anxious group were excluded from analysis because only three individuals were identified (trait anxiety scores below 30 and defensiveness below 4).

5.2.1.2 Asymptomatic controls

A control group of asymptomatic participants (n=20) was recruited from contacts within the university and the local area and asked to perform the same tasks as the patient group. Participants were all individuals who were either low-anxious (trait anxiety scores below 30 and defensiveness below 4) or scored in the mid-range for anxiety (31-41) and defensiveness (5-7). As participants were free from any current or past history of back pain, it was anticipated that the PHODA images would hold no specific or relevant threatening content. The recruitment of asymptomatic control participants enabled a comparison with any biases seen in the patient groups indicating either selective attention to, or avoidance of, back-pain relevant threatening information.

5.2.2 Dot probe paradigm

Participants completed a dot probe task comprising 20 practice trials and 250 experimental trials. The experimental trials were broken down into three blocks of: (i) 100 threat-neutral images; (ii) 100 positive-neutral images; and (iii) 50 neutral-neutral image pairings. The threat images were taken from the Photograph Series of Daily Activities (PHODA) image bank (Kugler et al., 1999) and were back pain specific, showing movements known to be associated with evoking pain or pain-related fear (e.g. lifting or bending tasks). These images show everyday activities, which would only represent a pain related threat to those with back pain rather than images of individuals in pain or more generally pain evoking images known to induce a response even in healthy individuals (Keogh et al., 2001). Although these images have not been rated for valence and arousal, previous research has used the images within dot probe studies (Leeuw, Goossens, van Breukelen, et al., 2007) and to rate patients' fear of movement (Trost et al., 2009). The positive and neutral images were taken from the International Affective Picture System (IAPS) (Lang et al., 2008) based on their valence and arousal ratings (Image numbers can be found in Appendix 5). The presentation sequence of the three blocks and the images within each of the blocks were randomized for each participant. Each trial began with a central fixation cross presented for 500ms, followed by an image pair, either, threat-neutral, positive-neutral or neutral-neutral pairs presented for 500ms. The size of each images was 12 x 20 cm, the distance between their inner edges was 9 cm. Images were presented to the left and right of the central point. Following presentation of the image pair, a probe stimulus (a pair of dots aligned either vertically horizontally) (diameter 7mm)

was presented in the location of either the emotional or neutral image and remained displayed until the participant responded (see Figure 5.1). Participants were asked to press as quickly and as accurately as possible one of two keys on a response button box (the right index finger for [:] and the left index finger for [..]) to identify the probe presented. The inter-trial interval varied randomly between 500 and 1250ms.

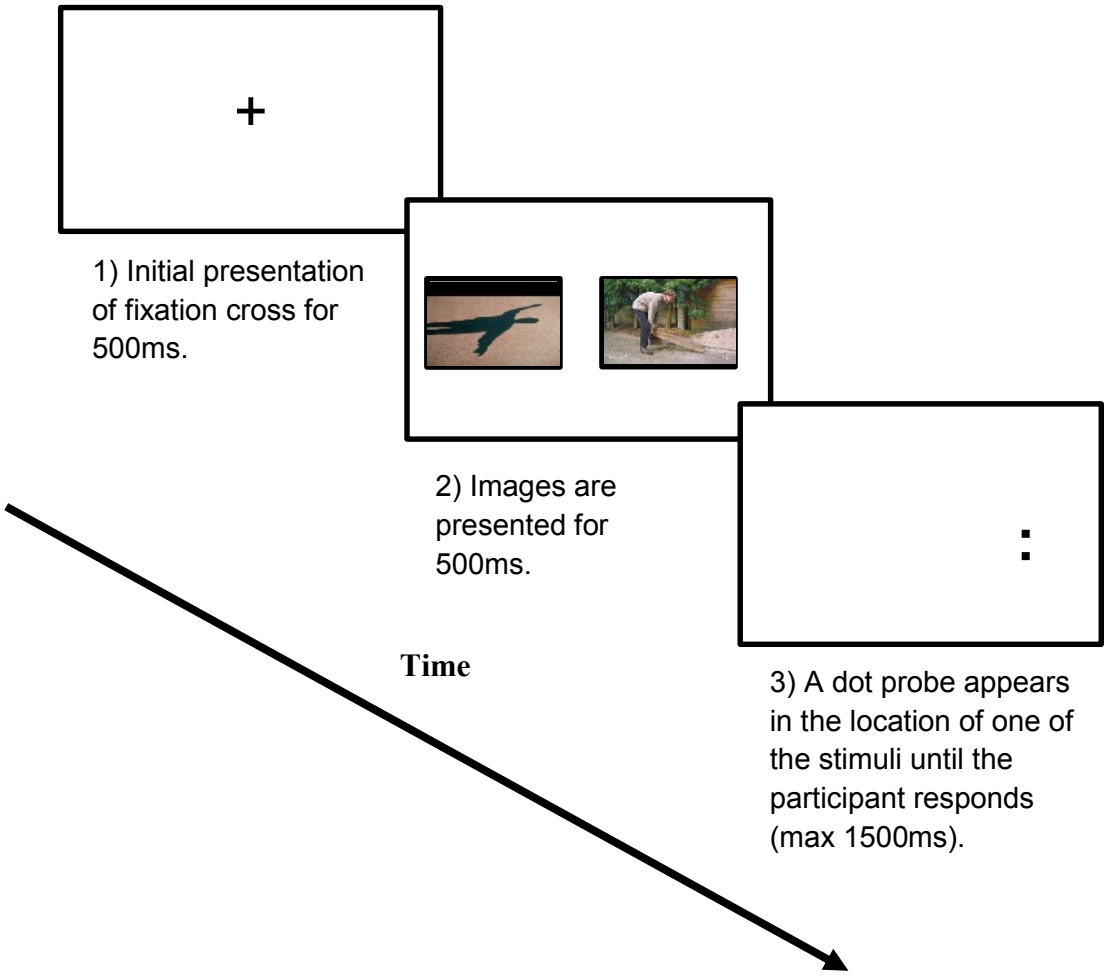

Figure 5.1. An example of the three stages of the dot probe task in the neutral threat condition.

5.2.3 Procedure

Participants were asked to sit at a desk in a black booth facing a 23inch screen (HP EliteDisplay E231) positioned approximately 70cm in front of them and at eye level, giving a visual angle of 11° between the central fixation cross and the centre of the stimulus. A desk mounted chin rest was used to reduce participant head movements, ensuring that each participant's eyes were level with the middle of the monitor and where the stimuli were presented. Participants were asked to attend to the fixation cross before each trial to standardize the starting location of their gaze. Trials were presented in three blocks to allow participants to rise and move around to accommodate any discomfort experienced by prolonged sitting. After completing the dot-probe task, participants completed the various self-report questionnaires described above.

5.2.4 Data analysis

5.2.4.1 Dot probe preparation

Attentional bias scores for threatening images relative to neutral were calculated for each participant from the reaction time data of the dot-probe trials using the formula:

((Trpr + Tlpl)/2)-((Nrpr + Nrpl + Nlpr + Nlpl)/4).

Where T= threat, N= neutral, p= probe, r= right position, l= left position.

For example:

Reaction times:

Threat right, Probe right – 524.95ms; Threat left, Probe left – 540.96ms; Neutral right, Probe right – 566.07ms; Neutral right, Probe left – 543.14ms; Neutral left, Probe right – 554.66ms; Neutral left, Probe left – 533.24

Threat attentional bias formula= ((524.95 + 540.96)/2)-((566.07 + 543.14 + 554.66 + 533.24)/4) = -16.32

Similarly, the attentional bias scores for positive images relative to neutral were calculated for each participant from the reaction time data with the formula:

((Prpr + Plpl)/2)-((Nrpr + Nrpl + Nlpr + Nlpl)/4).

Where P= positive, N= neutral, p= probe, r= right position, l= left position.

Therefore, negative reaction times indicate faster reactions times, therefore attention to emotional image and positive values reflect avoidance of the emotional image. The biases were calculated using this method, rather than comparing congruent to incongruent trials (Ioannou et al., 2004) because of differences that have previously been shown in the attentional biases of the four groups affecting the difference between congruent and incongruent trials (Mogg et al., 2000). Therefore, this method provides a more stable baseline (neutral/neutral reactions time) from which to compare the valanced (threat/positive) trials and the potential to separately consider the effects of congruent and incongruent trials. Reaction times shorter than 200ms, or longer than 1200ms, were removed from the analysis. Incorrect responses were also

excluded. Data from one individual was excluded from the study since their attentional bias score for both threat and positive images was more than two standard deviations from the mean. Errors and outliers accounted for 2.5% of the data.

5.2.4.2 Data analysis overview

A Multivariate Analysis of Variance (MANOVA) was performed on the attentional bias scores, with personality group as the independent variable, and attentional bias to positive and threatening images as dependent variables. A follow-up, between-group Analysis of Variance (ANOVA) was used to identify any differences in attentional bias between the personality groups. To confirm the existence of an attentional bias, t-tests were performed to ensure there was a significant difference from 0 in the mean attentional bias score. T-tests were performed between the control and non-extreme group to identify any differences in attentional bias.

5.3 Results

5.3.1 Trait anxiety and defensiveness: heterogeneity check

A heterogeneity check was performed on the personality groups prior to the main data analysis. The groups were significantly different in both anxiety ($F(3, 62) = 27.715$, $p < 0.01$) and defensiveness ($F(3, 62) = 53.015$, $p < 0.01$).

5.3.2 Comparisons between the non-extreme patients and control group

Attentional bias in the control group was assessed in order to determine whether the PHODA images contained any emotionally relevant content other than that associated with back pain related movements. The t-tests

demonstrated that the control group's attentional bias score to the PHODA images did not differ from 0 ($t(19)= 1.04$ $p> 0.05$), indicating that these images were not perceived as threatening by asymptomatic individuals.

To determine whether there was any systematic difference in attention towards or away from the PHODA images in the patient population, the attentional biases of the non-extreme patient group and control population were compared. This demonstrated that there was no difference between groups ($t(46)= 0.528$, $p> 0.05$). Indicating that any bias shown in the more extreme personality groups is indicative of their attention towards, or avoidance of, images perceived as specifically threatening to low back pain.

5.3.3 Patient group attentional bias scores

The mean reaction time scores for threatening and positive images for the defensive high-anxious, high-anxious, repressor and non-extreme groups are shown in Table 5.2.

Table 5.2. Mean RTs of congruent trials (in ms; standard deviations in brackets) for each condition in the dot probe task for the four groups; defensive high-anxious, high-anxious, repressor and non-extreme individuals.

	Defensive high-anxious	High-anxious	Repressors	Non-extreme
Threat (ms)	549.40 (±64.76)	584.52 (±56.92)	616.45 (±55.80)	591.24 (±70.60)
Positive (ms)	576.78 (±69.56)	589.53 (±59.91)	568.00 (±46.78)	577.48 (±73.67)
Neutral (ms)	577.44 (±67.47)	578.01 (±50.35)	597.90 (±54.56)	586.65 (±66.33)

The MANOVA revealed significant between group differences in attentional bias, (Wilks' Lambda = 0.621, $F(6, 122) = 5.459$, $p < 0.01$). A follow-up between group ANOVA showed a significant difference in attentional bias for threatening stimuli between personality groups ($F(3, 62) = 4.573$, $p < 0.05$). *Post hoc* Tukey HSD analysis showed the defensive high-anxious (M= -28.24; SD= ± 33.30) group differed significantly from both the high-anxious (M= 6.51; SD= ± 33.01; *ES*= 0.6) and repressor (M= 18.55; SD= ± 26.30 *ES*= 0.4) individuals (Figure 5.2). The t-tests showed the defensive high-anxious group had a significant attentional bias for threatening images compared to neutral ($t(17) = 3.59$, $p < 0.01$; *ES*= 0.8), whereas repressors had a significant avoidant bias of threatening images relative to neutral ($t(8) = 2.11$, $p < 0.05$; *ES*= 0.6). The high-anxious and non-extreme individuals showed no bias.

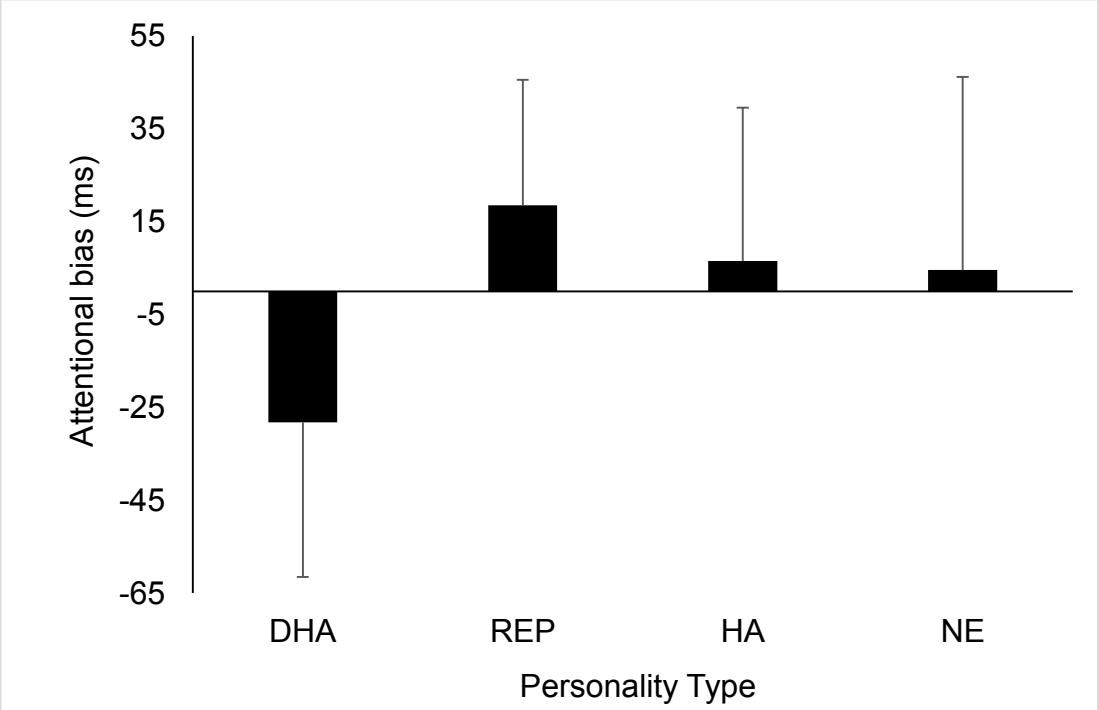

Figure 5.2. Attentional bias scores (in ms) for threat images for the four groups: defensive high-anxious (DHA), repressor (REP), high-anxious (HA) and non-extreme (NE) groups.

The second ANOVA showed a significant difference between groups in attentional bias for positive stimuli (F (3, 62) = 2.863, p< 0.05). *Post hoc* Tukey HSD analysis demonstrated the repressor (M= -29.90; SD= ± 22.42) group to be significantly different from both the high-anxious (M= 11.52; SD= ± 25.54; *ES*= 0.7) and the defensive high-anxious (M= -0.67; SD= ± 30.61; *ES*= 0.5) individuals (see Figure 5.3). The t-test analysis demonstrated that the repressor group had a significant attentional bias towards positive compared to neutral images (t(8)= 4.00, p< 0.01; *ES*= 0.8), while high-anxious individuals were shown to be avoidant of positive compared to neutral images (t(10)= 1.51, p< 0.05; *ES*= 0.4). The defensive high-anxious individuals showed no bias for positive or neutral images.

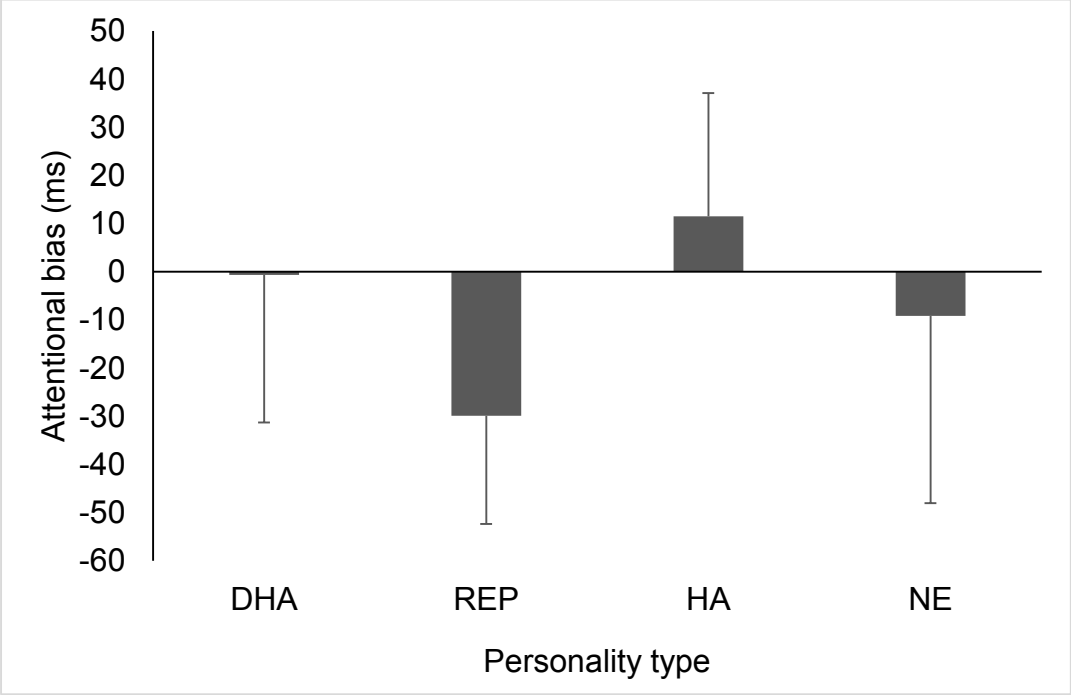

Figure 5.3. Attentional bias scores (in ms) for positive images for the four groups: defensive high-anxious (DHA), repressor (REP), high-anxious (HA) and non-extreme (NE) groups.

5.3 Discussion

To the author's knowledge, this is the first study to investigate the attentional biases demonstrated by Weinberger et al.'s (1979) personality types within a chronic musculoskeletal pain population. The study aimed to test and extend Eysenck's (1997) Theory by examining specific hypotheses about the attentional biases of defensive high-anxious individuals when presented with pain-related stimuli. The results of this study offer support for some elements of Eysenck's (1997) predictions with regard to the attentional biases exhibited by the different personality groups. Contrary to Eysenck's Theory there were differences between defensive high-anxious and high-anxious individuals. The defensive high-anxious group were shown to demonstrate attention towards threatening information but showed no bias with respect to positive images, in contrast, high-anxious individuals were avoidant of positive images but demonstrated no bias towards the threatening information. Repressors were avoidant of threatening information and attended selectively to positive stimuli.

It could be suggested, that the combination of high anxiety and defensiveness has an amplifying effect on the perception of threat resulting in the greater attentional response in this personality group. Eysenck (1997) suggested that defensive high-anxious individuals would be likely to demonstrate similar attentional biases to high-anxious individuals. This study, however, suggests that their biases are different when pain-related threat specific images are used. These findings have important implications for the future assessment of high-anxious and defensive high-anxious individuals who present for pain-related treatments.

Defensive high-anxious individuals are often not included as a separate group in research studies, defensiveness is either not measured or individuals are combined with high-anxious individuals to form a single group (Fox, 1993; Holtgraves and Hall, 1995; Jones et al., 2004; Mogg et al., 2000). This approach may produce contradictory findings between studies as the proportion of defensive high-anxious and high-anxious individuals varies considerably between sample populations. Given the particularly high proportion of defensive high-anxious individuals found within clinical pain populations, it is important that the behaviours of these individuals are investigated further to provide additional understanding of their attentional biases to clinically-related threatening information. It has been suggested (Ioannou et al., 2004) that defensiveness may affect the attentional resource allocation in response to threatening information differently in those with either high or low trait anxiety. A central tenent of Eysenck's Theory is that high levels of trait anxiety cause an enhanced vigilance towards threatening information and that defensive high-anxious individuals attempt to utilize a defensive strategy, which is ineffective, and leads to elevated levels of anxiety. The enhanced attention to pain-related information in the defensive high-anxious individuals may explain why this sub-group of the population have been found to be more persistent in seeking treatment for their pain (Franklin et al., 2014) with some studies suggesting that cognitive-behavioural treatments can help to reduce selective attention to pain stimuli (Dehghani et al., 2004; Sharpe et al., 2012). The present findings suggests that interventions within the defensive high-anxious group in particular should focus on educating patients as to how they can control their attention to pain symptoms.

The data show that the high-anxious individuals do not demonstrate a bias towards threatening information. This finding supports Mogg et al. (2000) who also found that high-anxious individuals demonstrated no bias when presented with physical threat words. They suggested that this could be due to high-anxious individuals utilizing strategies to counteract their vigilant tendencies. The high-anxious group in this study did show avoidance of positive images as suggested by Eysenck (1997). Eysenck's Four-factor Theory suggested that cognitive biases are more evident when state anxiety levels are high. Further research should investigate the attentional biases of chronic back pain patients in situations of elevated anxiety. This could be achieved, potentially, by asking participants to view the images with an intention to imitate the movements observed since this instructional set has been shown to lead to heightened motor evoked potentials in action-observation studies (Caspers et al., 2010).

This study provides further evidence in support of Eysenck's (1997) predictions about repressors within a specific back pain population. Numerous studies have investigated repressor individuals within chronic illness (Frasure-Smith et al., 2002), and the general population (Eysenck and Derakshan, 1997; Myers, 1998). These studies have found a pattern of avoidance of negative information suggesting that the repressor group are consistent in their attentional biases, irrespective of the situation. It may be a desire to manage self-presentation and be perceived to experience lower anxiety, despite their physiological similarity to high-anxious and defensive high-anxious individuals (Derakshan and Eysenck, 2001b).

There are some limitations within this study, which should be considered. Firstly, the PHODA images used were not assessed to confirm their affective impact (valence and arousal), however, these images have been used in previous dot probe studies, and to assess perceived harmfulness of daily activities (Barke et al., 2012; Leeuw, Goossens, van Breukelen, et al., 2007). Furthermore, patients within this study reported that they could attribute the images to their daily life and the activities would be difficult for them to complete at home. Analysis of the control group demonstrated that the PHODA images represented a neutral image set for those without back pain, and thus the biases shown in the patient groups can be attributed to the pain specific content of the image set. Secondly, the high-anxious and repressor group were small, however, the effect sizes were moderate to high (0.4-0.8). Future research should recruit larger sample sizes to provide support for these differences. Due to their scarcity in the general population, it was not practical to recruit a control population of defensive high-anxious individuals. It is reasonable to assume that these groups would perceive the PHODA images as neutral as well. Finally, the images within this study were not matched for content, contrast and brightness, however, the comparisons within the control group give confidence that any differences in these elements did not distort the findings in any systematic manner.

In summary, the present study provides evidence of an attentional bias to threatening information in the defensive high-anxious group. In addition, the different responses demonstrated by the high-anxious individuals highlight the need to ensure they are investigated as two heterogeneous groups and not conflated to create a single high-anxious population. The present findings

contribute to the literature and help to explain the cognitive processes of defensive high-anxious individuals within a musculoskeletal pain population. The demonstration of an attentional bias to pain specific threatening information could explain why defensive high-anxious individuals are more likely to show persistence in the pain management system.

CHAPTER 6

6.0 Study 3: Influence of defensiveness on disability in a chronic musculoskeletal pain population.

6.1 Introduction

By its nature chronic musculoskeletal pain is a complex problem to manage and individuals who suffer from it tend to be heavy users of the healthcare system. There is increasing evidence to show that cognitive factors are relevant to the development of, and treatment response to clinical outcome from chronic pain (Bair et al., 2003; Woby et al., 2008). Anxiety levels, in particular, can increase fear of movement and, as a result, are associated with differences in pain perception and disability. Pain-related state-anxiety has been shown to predict pain and disability at 12-months follow-up (Bair et al., 2013), however, an individual's trait-anxiety will also affect how they respond to pain. Cognitive factors such as a tendency to selectively attend to physical stimuli and to interpret such stimuli negatively can amplify the pain experience (Schoth and Liossi, 2010). The four groups proposed by Weinberger et al. (1979) demonstrate different attentional and interpretive biases, which influence their perception of threatening stimuli (Weinberger, 1990). Within the previous chapter, the defensive high-anxious group demonstrated an attentional bias towards back-pain related information, whereas the repressors avoided threatening information. Within some clinical populations, variations in trait-anxiety and defensiveness have been strongly linked to differences in treatment preferences and health outcome (Myers, 2010).

Previous research has primarily investigated the way repressors respond to pain (Elfant et al., 2008) and cope with illnesses such as cancer

(Kreitler et al., 1993; Prasertsri et al., 2011). Few studies have identified all four personality types, with defensive high-anxious individuals often omitted due to their scarcity within the general population (estimated at 7%-10%). In a notable exception, Prasertsri et al. (2011) identified the four groups in a lung cancer outpatient group. The authors found that defensive high-anxious individuals reported higher catastrophising than repressors. This may be indicative that, due to their attentional bias towards threatening information, defensive high-anxious individuals have enhanced negative thoughts about their pain and adopt maladaptive coping strategies. Furthermore, in a low back pain population, Franklin et al. (2014) found that defensive high-anxious individuals were the most persistent in seeking treatment and reported higher depression and disability compared to repressors and low-anxious individuals. The tendency for these individuals to continue to seek treatment may explain the higher proportion of defensive high-anxious individuals found in chronic pain populations. These findings suggest that variations in defensiveness and trait-anxiety together, affect the experience of and response to pain symptoms.

Due to the scarcity of defensive high-anxious individuals in the general population, there is limited evidence of how they respond to threatening situations (e.g., chronic pain). In light of the high proportion of defensive high-anxious individuals identified from the limited body of research in musculoskeletal pain populations, it would seem important to investigate further how they respond to chronic pain to better understand why they appear to be disproportionately represented. Unlike in previous research, individuals who score in the mid-range on trait-anxiety and defensiveness (‘non-extreme’ scorers) were included in the current study to help understand how they differ

from more extreme defensive high-anxious individuals. Consequently, this study aims to identify: (i) the proportion of defensive high-anxious individuals as defined by Weinberger et al. (1979) within a chronic musculoskeletal pain population; and (ii) whether personality type affects the relationships between cognitive factors and disability.

6.2 Method

6.2.1 Participants

Participants were 79 patients with chronic musculoskeletal pain referred to a hospital for treatment. Patients suffering from chronic pain for more than 3 months were given an information pack by their clinician asking them to contact the Chief Investigator of the study if they wished to take part. Volunteer participants then completed a series of self-report measures. The four personality types (repressors, n= 13; defensive high-anxious, n= 26; high-anxious, n= 11; and non-extreme, n= 29) were assessed based on criterion splits on the trait subscale of the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983) and the Marlowe-Crowne Social Desirability Scale (MC-SDS) (Strahan and Gerbasi, 1972).

6.2.2 Measures

Participants were given questionnaires assessing current pain intensity, defensiveness, trait anxiety, catastrophising, depression, disability, functional self-efficacy and kinesiophobia (see the general method for more detail about each questionnaire).

6.2.3 Statistical analyses

An initial heterogeneity check was performed to ensure the groups differed in defensiveness and trait-anxiety. Zero-order correlations were calculated to determine the relationships between the cognitive factors. A Multivariate Analysis of Variance (MANOVA) and Analysis of Variance (ANOVA) and *post-hoc* Tukey Honest Significant Difference (HSD) were conducted to identify between-group differences on the cognitive measures. Three hierarchical regression analyses were performed to determine the extent to which the cognitive measures predicted levels of disability in the whole population, defensive high-anxious group and the non-extreme group. With disability as the outcome variable of interest, age, sex and pain duration were entered in step 1, pain intensity in step 2, and the cognitive variables were entered in step 3. Due to low numbers, the repressor and high-anxious groups were excluded from regression and ANOVA analysis.

6.3 Results

6.3.1 Patient Characteristics

Table 6.1 shows the baseline characteristics for the groups. All groups reported moderate levels of pain (NRS 5.5-6.4) and moderate to high levels of disability (RDQ 12.63-18.60). A statistical heterogeneity check was performed for the three personality groups prior to the main data analysis to confirm differences in trait-anxiety and defensiveness. The ANOVA for trait-anxiety revealed significant differences between the three groups, $F(2, 54)= 17.603$, $p< 0.01$. *Post-hoc* analysis confirmed the defensive high-anxious differed significantly from the non-extreme group. In addition, the high-anxious group

differed from the non-extreme group. The ANOVA of the MC-SD scores showed significant differences between the three groups, $F(2, 54)= 52.179$, $p< 0.01$. *Post-hoc* analysis confirmed significant differences in MC-SD scores between the defensive high-anxious and the high-anxious and non-extreme individuals.

Table 6.1. Mean ± SD baseline characteristics of the five groups.

	DHA (n= 26)	HA (n= 11)	REP (n= 13)	LA (n= 0)	NE (n=29)
Proportions (%)	33	14	16	0	37
Sex (Female/Male)	16/2	7/3	4/1	0	20/7
Age (years)	56.56 ± 16.00	44.70 ± 12.51	44.17 ± 11.03	0	54.31 ± 14.79
Pain duration (years)	11 ± 12	9 ± 9	8 ± 7	0	10 ± 14
Pain Intensity	5.7 ± 2.72	6.4 ± 2.08	6.3 ± 1.30	0	5.5 ± 2.44
Defensiveness	8.33 ± 0.59	3.80 ± 1.86	9.00 ± 0.17	0	6.30 ± 1.14
Trait anxiety	50.61 ± 6.34	55.50 ± 16.53	26.20 ± 3.03	0	40.19 ± 8.81
Disability	16.89 ± 4.07	18.60 ± 5.70	13.40 ± 5.98	0	12.63 ± 5.48
Catastrophising	28.06 ± 13.58	28.00 ± 14.12	17.40 ± 11.19	0	16.93 ± 11.32
Depression	27.67 ± 8.21	33.70 ± 15.05	10.00 ± 5.79	0	14.44 ± 8.58
Self-efficacy	33.72 ± 21.13	24.30 ± 15.18	39.20 ± 24.19	0	43.74 ± 20.65
Kinesiophobia	25.94 ± 8.08	29.70 ± 10.78	21.00 ± 7.11	0	23.11 ± 8.76

6.3.2 Distribution differences between the patient and control population

The chi-square demonstrated a significant difference was found between the groups for the proportion of defensive high-anxious individuals (χ^2 (4)= 36.00, $p < 0.05$), reflecting a greater number of defensive high-anxious individuals in the patient (33%) compared to the control group (4%) (Figure 6.1).

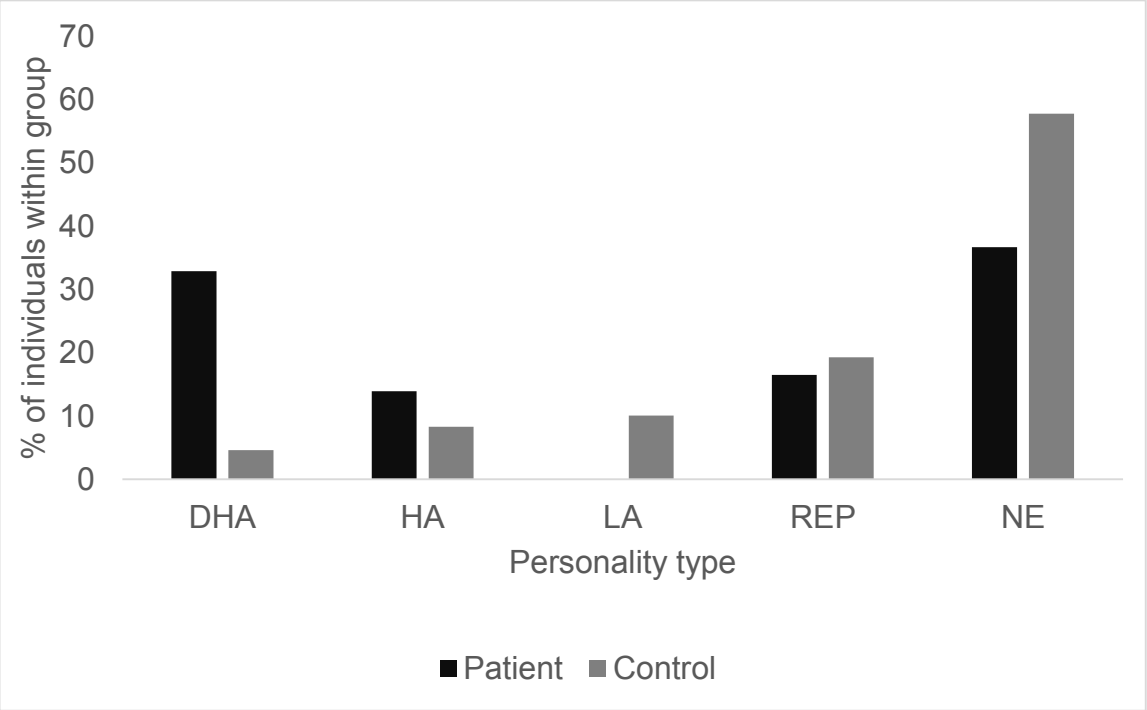

Figure 6.1. Percentage of individuals within the patient and control population.

6.3.3 Relation between the psychological measures

Table 6.2 indicates there were significant correlations between the cognitive measures. Catastrophising was negatively related to self-efficacy and positively related to depression, kinesiophobia, trait-anxiety, depression and pain intensity. Depression was negatively correlated with self-efficacy and positively related to defensiveness, trait-anxiety, catastrophising, kinesiophobia, pain intensity and disability. Self-efficacy was associated negatively with trait-anxiety, catastrophising, depression, pain intensity and disability. Kinesiophobia was associated negatively associated with self-efficacy and positively related to trait-anxiety, catastrophising, depression and disability.

The MANOVA showed significant between-group differences in cognitive variables (Wilks' Lambda = 0.232, $F(21, 144)$ $p< 0.05$). The ANOVA demonstrated a significant difference between the defensive high-anxious and non-extreme group and between the high-anxious and non-extreme groups for disability. A significant difference was found between the defensive high-anxious and non-extreme group for catastrophising. The defensive high-anxious and high-anxious groups both differed from the non-extreme individuals and repressors for depression. No significant differences were found between groups for pain intensity, self-efficacy or kinesiophobia.

Table 6.2. Zero-order correlations between the psychological factors, pain intensity and disability.

	Pain Intensity	Defensiveness	Trait anxiety	Disability	Catastrophising	Depression	Self-efficacy	Kinesiophobia
Pain Intensity	-							
Defensiveness	-.168	-						
Trait anxiety	.166	-.447**	-					
Disability	.421**	-.256*	.540**	-				
Catastrophising	.295*	-.170	.482**	.635**	-			
Depression	.338**	-.379**	.762**	.728**	.611**	-		
Self-Efficacy	-.457**	.127	-.440**	-.699**	-.409**	-.620**	-	
Kinesiophobia	.028	-.243	.372**	.409**	.633**	.511**	-.367**	-

6.3.4 Regression analysis

6.3.4.1 Preliminary examination of the data

None of the correlation coefficients (Table 6.2) exceeded 0.90, indicating the data were not affected by singularity. Durbin-Watson values were within acceptable limits for all regression analyses, suggesting that the assumption of independent errors was met. The predictor variables used in each of the regression analyses had variance inflation factors that were considerably less than 10 and tolerance levels that were higher than 0.2 indicating no problems with multicollinearity.

6.3.4.2 Analyses 1- predicting disability from the cognitive measures in the defensive high-anxious group

Age, sex and pain duration were not significantly related to levels of disability (p= 0.11). In the second step, current pain intensity was shown to be unrelated to levels of disability (p= 0.23). After controlling for the effects of demographics and pain intensity, self-efficacy, depression and catastrophising explained 48% (p< 0.01) of the variance in levels of disability. Examination of the beta values (Table 6.3) revealed that lower self-efficacy (β= -0.66, p< 0.05) greater depression (β= 0.66, p< 0.05), and greater catastrophising (β= 0.44, p< 0.05) were related to greater levels of disability.

Table 6.3. Regression analysis on the defensive high-anxious group (n= 26) with disability as the dependent variable.

Step	R^2	R^2 change	F change	Standardised β	t
1. Demographics	0.32	0.32	2.32		
Age				-0.69	-2.37
Sex				0.43	1.82
Pain duration				0.27	0.99
2. Pain intensity	0.40	0.07	1.53	0.30	1.23
3. Cognitive factors	0.88	0.48	8.73*		
Self-efficacy				-0.66	-2.89*
Depression				0.66	2.71*
Catastrophising				0.44	2.51*
Kinesiophobia				-0.09	-0.55

6.3.4.3 Analyses 2- predicting disability from the cognitive measures in the non-extreme group

Table 6.4 shows that in step 1, age, sex and pain duration were not significantly related to levels of disability (p= 0.25). In step 2, current pain intensity significantly explained 36% (p< 0.05) of the variance in disability. After controlling for the effects of demographics and pain intensity, the cognitive measures did not contribute to the variance in levels of disability. Examination of the beta values for the final model revealed that higher pain intensity (β= 0.50, p< 0.05) was related to greater levels of disability.

Table 6.4. Regression on the non-extreme group (n= 29) with disability as the dependent variable.

Step	R^2	R^2 change	F change	Standardised β	t
1. Demographics	0.16	0.16	1.47		
Age				-0.21	-1.04
Sex				0.11	0.55
Pain duration				0.39	1.89
2. Pain intensity	0.36	0.25	6.96*	0.50	2.64
3. Cognitive factors	0.60	0.42	2.74		
Self-efficacy				-0.35	-1.70
Depression				0.10	0.36
Catastrophising				0.47	1.65
Kinesiophobia				-0.19	-0.89

6.3.4.4 Analyses 3- predicting disability from the cognitive measures in the whole population

Table 6.5 shows that age and pain duration were significantly related to levels of disability ($p< 0.05$) and explained 17% of the variance. In the second step, current pain intensity explained 11% of the variance in disability ($p< 0.05$). After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 42% ($p< 0.01$) of the variance in disability. Examination of the beta values (Table 5) revealed that younger age ($\beta= -0.29$, $p< 0.05$), longer pain duration ($\beta= 0.39$, $p< 0.05$), higher pain intensity ($\beta= 0.37$, $p< 0.05$) and depression ($\beta= 0.36$, $p< 0.05$) and lower self-efficacy ($\beta= -0.40$, $p< 0.05$), were related to greater levels of disability.

Table 6.5. Regression on the whole population (n= 79) with disability as the dependent variable.

Step	R^2	R^2 change	F change	Standardised β	t
1. Demographics	0.17	0.17	5.01*		
Age				-0.29	-2.48*
Sex				-0.09	-0.87
Pain duration				0.39	3.38*
2. Pain intensity	0.28	0.11	10.95*	0.37	3.31
3. Cognitive factors	0.71	0.42	24.40**		
Self-efficacy				-0.40	-4.04*
Depression				0.36	3.41*
Catastrophising				0.18	1.99
Kinesiophobia				-0.05	-0.57

6.4 Discussion

There were two aims to this study, firstly, to identify the proportion of defensive high-anxious individuals, as defined by Weinberger et al. (1979), within a chronic musculoskeletal pain population. Secondly, to identify whether variations in defensiveness, affect the relationships between cognitive factors and disability.

Only two studies have investigated the proportion of defensive personality types in a chronic low back pain (Lewis, Fowler, et al., 2012) and a chronic fatigue syndrome population (Creswell and Chalder, 2001). Whilst there is a relatively low proportion of defensive high-anxious individuals in the general population, this study supports previous research (Creswell and Chalder, 2001; Lewis, Fowler, et al., 2012), with evidence of a higher proportion of defensive high-anxious (33%) individuals in a chronic musculoskeletal pain population. This supports the notion proposed by Franklin et al. (2014) that defensive high-anxious individuals are more persistent in the care system and thus more likely to be referred to hospital based pain management centers. The low number of repressors in this study (16%) might indicate a reduced willingness to seek treatment and a preference to self-manage. Previous research has found repressors respond better to treatment when they maintain a feeling of control and tend to be overly optimistic regarding their own behaviours, which may influence their response and adherence to treatment (Jones et al., 2004; Myers, 2010).

An individual's interpretation of their pain intensity is a complex phenomenon. Franklin et al. (2014) found that although defensive high-anxious and repressor individuals reported similar levels of pain intensity, their interpretation of this pain, indicated through levels of depression and disability, varied. Interestingly, the defensive high-anxious and high-anxious groups in this study reported significantly higher catastrophising and depression and lower self-efficacy compared to the non-extreme group. Both groups (high-anxious and defensive high-anxious), reported similar levels of pain intensity, and there were no differences in their pain duration. These findings support the suggestion by Eysenck (1997) that defensive high-anxious individuals have similar interpretive biases to threat as high-anxious individuals, and also highlights important individual differences when treating patients. Defensiveness and trait-anxiety are both assumed to be relatively stable traits. Therefore, the corroboration of findings of a high proportion of defensive high-anxious individuals found in this study, and the increased likelihood of re-presenting for treatment would suggest this group might differ in their approach to managing chronic pain from the high-anxious group.

The second aim of this study was to identify whether the level of defensiveness affected the relationships between cognitive factors, pain intensity and disability. To the author's knowledge, there are no studies which have investigated the effect of cognitive factors on disability using Weinberger et al.'s (1979) personality types in a chronic musculoskeletal pain population. When the population was analysed as a whole, pain intensity explained 11% of the variance in disability and the cognitive factors (depression and self-efficacy) explained 42%. The present study showed distinct differences

between the influence of pain intensity and cognitive factors on disability when the population were stratified based on defensiveness and anxiety. Higher levels of depression, catastrophising and lower levels of self-efficacy had a greater effect on the prediction of disability in the defensive high-anxious group. However, within the non-extreme group no such relationship was shown. Interestingly, whilst the cognitive variables did not influence disability for the non-extreme group, pain intensity explained 36% of the variance in disability.

Identifying individuals with high defensiveness and trait-anxiety has provided interesting insights into the relationship between pain and disability. Within the defensive high-anxious group, pain intensity had no significant relationship with disability, whereas, cognitive factors (catastrophising, depression and self-efficacy) explained 48% of the variance. Previous research within a cancer population (Prasertsri et al., 2011) found that defensive high-anxious individuals engaged in significantly more catastrophising and reported greater depression compared to those with lower trait-anxiety. The difference in the influence of catastrophising on disability, shown between the defensive high-anxious group and the other patients, may provide insight into the variability of this relationship in previous literature. Interestingly, previous studies in which catastrophising failed to predict disability have primarily drawn participants from primary care, acute pain groups (George et al., 2006; Hirsh et al., 2008). Based on the work by Franklin et al. (2014), it may be reasonable to assume that the proportion of defensive high-anxious individuals in these populations would be much lower than that

seen in the hospital-based interventions. It could thus indicate that the differentiator between these studies is the degree of defensiveness.

Catastrophising is a maladaptive cognitive method of coping with pain (Keefe et al., 1989), high catastrophising can lead individuals to be more pessimistic about coping strategies, to worry and be more likely to anticipate negative outcomes. Research has shown that vigilance to threatening stimuli (e.g., disability) is related to catastrophic thinking (Crombez et al., 2004). If defensive high-anxious individuals are more likely to focus on their condition and utilise maladaptive strategies, this could explain why they re-present for treatment and may perceive no improvement in treatment outcome. Therefore, for defensive high-anxious individuals, strategies that focus on pain-related outcomes may not be as beneficial as those focused on reduced worry about future events, such as disability and daily functioning.

Although cognitive factors explained a large proportion of variance in disability for the defensive high-anxious group, it is surprising that kinesiophobia was not linked with changes in disability. This finding is consistent with Thompson et al. (2010) who suggested that self-efficacy is likely to emerge as a stronger predictor of disability when investigated alongside pain-related fear in patients with chronic pain. Findings of the present study are in agreement that low self-efficacy was a significant predictor of disability alongside depression and catastrophising (Denison et al., 2004; Woby, Roach, et al., 2007).

Notably, within the non-extreme group, pain intensity showed a stronger relationship with disability compared with cognitive factors. This supports previous studies which have shown pain intensity to describe a moderate amount of variance within these factors (Vlaeyen et al., 1995). This is in line with the strong correlation between pain intensity and disability previously reported within acute pain populations (Glombiewski et al., 2010). Within the non-extreme individuals, pain coping strategies learnt at pain management programmes may allow them to effectively reduce levels of pain intensity. In turn, this may lead to lower levels of disability and greater satisfaction with treatment.

Based on the findings of this study, it can be concluded that the interaction of defensiveness and trait anxiety plays an important role in determining the progression and outcome of chronic pain. Differentiating the defensive high-anxious group revealed different patterns of relationship between a range of cognitive factors and disability. This may explain some of the variance evident from previous literature where trait-anxiety was the sole focus. This has important clinical implications, which highlight the necessity of assessing personality characteristics that include defensiveness in order to identify individuals whose characteristic patterns of cognition influence their levels of disability. Future research of a longitudinal nature should aim to examine the mechanisms of causality implied by these findings. If personality type can be identified as a predictor of poor adjustment in chronic pain populations, long term, and early interventions could be customized to meet the unique needs of this group (e.g., in high defensive and trait-anxious individuals).

CHAPTER 7

7.0 Study 4: Longitudinal associations between personality type, psychological variables, disability and treatment satisfaction in chronic pain patients.

7.1 Introduction

The previous chapter demonstrated that considering the interactions between defensiveness and trait-anxiety provides interesting insights into the relationship between pain and disability. Within the defensive high-anxious group, pain intensity had no significant relationship with disability, but the cognitive factors (catastrophising, depression and self-efficacy) explained 48% of the variance in disability. Whereas within the non-extreme group the reverse was true with the cognitive factors shown to not affect the variance in disability while pain intensity explained 36%.

A cross-sectional study looks at a snap shot in time and the relationships identified in the previous study are informative, however, it is important to investigate whether cognitive factors are predictive of outcome. A longitudinal study allows for patients to be tracked over time, providing additional evidence of how cognitive factors, pain and disability and the relationships between them develop during the pain management process.

A critical consideration when investigating treatment outcome is the minimal clinical important change (MCIC). Ostelo and de Vet (2005) suggested that MCIC is defined as the smallest change in an outcome measure necessary to yield a clinically important change in the health status of the patients. Therefore, for the purpose of this study, the MCIC of patient's pain intensity and disability will be used. For pain intensity, a reduction of 2 points

(Salaffi et al., 2004) and for disability a reduction of 3 points in RDQ (Ostelo and de Vet, 2005) are classed as improvement.

The aims of this study were (i) to identify whether personality type affects the relationships between pain intensity, cognitive factors and disability at three and six months post baseline; and (ii) to identify whether personality type affects the likelihood of achieving a MCIC in pain intensity or disability at three and six months.

7.2 Method

7.2.1 Participants

Participants were recruited from the patient pool used in the cross-sectional study. If patients responded to the first questionnaire in the cross-sectional study (Chapter 6), they were then sent a second questionnaire at three months. From the first study sample of 79, 58 (73%) patients responded to the second questionnaire. Patients who responded to the second questionnaire were then sent a third questionnaire six months post baseline (n= 47 completed (59% from the first study). Patients who responded to the six month questionnaire were then sent the final questionnaire pack at 12 months (n= 31 completed (39% from the first study). If participants had not responded to a questionnaire pack within three weeks, they were sent a reminder letter and questionnaire pack. If they did not respond to the reminder, they were assumed to have withdrawn from the study.

7.2.2 Measures

At each time point, participants completed the same questionnaire pack as used at baseline assessing defensiveness, trait-anxiety, current pain intensity, satisfaction with treatment, disability, catastrophising, depression, functional self-efficacy and kinesiophobia. Two additional questions were added at three, six and 12 months, assessing satisfaction with ability to cope with pain and satisfaction with current pain intensity.

7.2.3 Statistical analyses

Heterogeneity checks were completed to ensure the groups differed in defensiveness and trait-anxiety. Analysis of variance (ANOVA) and *post-hoc* Tukey honest significant difference (HSD) tests were conducted to identify between-group differences in the cognitive measures, pain intensity, and the three measures of satisfaction. In order to identify the influence of personality type on the relationships between baseline cognitive measures and their ability to predict disability at three and six months, hierarchical regressions were performed on the whole population, and on the defensive high-anxious and non-extreme groups separately. With disability as the outcome variable of interest, age, sex and pain duration were entered in step 1, pain intensity in step 2, and the baseline cognitive variables were entered in step 3. All tests were conducted on both the three and six month data. Due to low power, no statistical analysis was carried out on the 12 month data. Furthermore, Due to low numbers, the repressor (three month, n= 8; six month, n= 6) and high-anxious (three month, n= 8; six month, n= 8) individuals were excluded from separate regression analysis.

The MCIC from baseline to three and six months for disability and pain intensity were calculated for the defensive high-anxious and non-extreme groups separately. T-tests were used to identify differences from baseline to three months and six months in psychological measures and satisfaction in the defensive high-anxious and non-extreme groups.

7.3 Results

A statistical heterogeneity check was performed for the four groups (defensive high-anxious, high-anxious, repressor and non-extreme) at three and six months post baseline which indicated that they continued to differ on measures of anxiety and defensiveness.

7.3.1 Differences between the personality types at three and six months

At three months, the defensive high-anxious individuals reported significantly higher disability than the repressors ($F(3, 57)= 2.54$, $p< 0.05$). The high-anxious individuals reported significantly higher depression than the repressors at both three ($F(3, 57)= 3.05$, $p< 0.05$) and six months ($F(3, 46)= 2.54$, $p< 0.05$). The high-anxious group also reported significantly lower satisfaction with ability to cope than either the defensive high-anxious or repressor groups $F(3, 46)= 3.67$, $p< 0.05$. No significant differences were found between the four groups for pain intensity, satisfaction with treatment, satisfaction with current pain, disability, catastrophising, self-efficacy or kinesiophobia.

7.3.2 Patient characteristics

7.3.2.1 Defensive high-anxious individuals

Table 7.1. Mean (±SD) for the defensive high-anxious group at each time point (* indicates significantly different from baseline).

	Baseline (n= 26)	3 month (n= 20)	6 month (n= 16)	12 month (n= 7)
% of whole population	33	34	34	23
Age (years)	55.19 (16.73)	56.35 (16.63)	55.38 (17.05)	58.71 (17.81)
Sex	20 Females 6 Males	16 Females 4 Males	12 Females 4 Males	5 Females 2 Males
Pain duration (years)	9.28 (11.98)	9.02 (11.62)	5.90 (5.95)	8.86 (6.89)
Satisfaction-treatment	5.38 (3.13)	6.25 (3.26)	7.56 (2.58)	5.43 (1.51)
Satisfaction-ability to cope	Not measured	5.60 (3.25)	6.19 (2.99)	4.43 (2.70)
Satisfaction-current pain	Not measured	5.55 (2.99)	5.81 (3.15)	4.00 (2.71)
Pain intensity	6.08 (2.54)	5.50 (2.96)	5.00 (2.92)	5.00 (2.89)
Disability	17.35 (4.87)	15.20 (6.58)	13.94 (7.66)	14.43 (6.70)
Catastrophising	28.77 (13.07)	25.65 (12.17)	22.88 (12.58)	27.43 (9.93)
Depression	25.58 (10.29)	22.80 (11.30)*	19.06 (13.60)*	21.86 (9.87)
Self-efficacy	32.50 (20.77)	31.00 (22.90)	41.00 (22.73)	35.00 (22.29)
Kinesiophobia	26.85 (7.49)	26.80 (6.90)	25.50 (8.73)	28.43 (7.48)

The t-tests for the characteristics of the defensive high-anxious group demonstrate significant reductions in depression ($t(19)= 2.86$, $p> 0.01$) and disability ($t(19)= 2.19$, $p> 0.05$) from base to both three months and to six

months (depression, $t(15)= 2.39$, $p> 0.05$; disability, $t(15)= 2.29$, $p> 0.05$) (Table 7.1). At 12 months levels of disability, catastrophising, depression and kinesiophobia increased and satisfaction with pain, ability to cope and treatment and self-efficacy decreased. The only measure to remain consistent is pain intensity. No statistical tests were performed between baseline and 12 month measures.

7.3.2.2 Non-extreme individuals

Table 7.2. Mean (±SD) for the non-extreme group at each time point.

	Baseline (n= 29)	3 month (n= 22)	6 month (n= 17)	12 month (n= 14)
% of whole population	38	37	36	46
Age (years)	54.41 (14.19)	55.23 (14.56)	54.12 (15.01)	53.57 (14.05)
Sex	21 Females 8 Males	15 Females 7 Males	11 Females 6 Males	8 Females 6 Males
Pain duration (years)	10.62 (13.34)	11.34 (14.27)	14.09 (15.60)	13.33 (13.76)
Satisfaction - treatment	6.38 (2.61)	7.05 (2.82)	6.76 (2.93)	5.21 (2.42)
Satisfaction - ability to cope	Not measured	5.81 (2.86)	4.71 (2.91)	4.57 (2.34)
Satisfaction - current pain	Not measured	5.14 (2.63)	4.12 (3.24)	4.07 (2.84)
Pain intensity	5.83 (2.39)	5.95 (2.65)	6.06 (2.63)	5.50 (2.93)
Disability	14.69 (5.59)	13.45 (5.16)	14.94 (5.99)	13.64 (5.08)
Catastrophising	21.52 (14.62)	18.05 (14.23)	20.53 (14.42)	16.00 (12.89)
Depression	20.41 (13.44)	16.77 (10.96)	20.82 (13.47)	22.07 (15.14)
Self-efficacy	35.52 (20.55)	37.18 (22.45)	33.76 (22.55)	32.57 (20.26)
Kinesiophobia	24.83 (9.62)	24.00 (6.36)	26.29 (8.56)	24.93 (6.71)

In contrast to the defensive high-anxious individuals, the non-extreme group demonstrated a mixed pattern of results over time (Table 7.2). From baseline to three months; disability, catastrophising, depression, and self-efficacy improved marginally and participants were more satisfied with treatment. At six months, all measures became worse, and patients reported they were less satisfied overall. At 12 months, participants continued to report low levels of

satisfaction with treatment, ability to cope and current pain, however, they reported lower disability, catastrophising and kinesiophobia.

7.3.2.3 Repressor individuals

Table 7.3. Mean (±SD) for the repressor individuals at each time point.

	Baseline (n= 13)	3 month (n= 8)	6 month (n= 6)	12 month (n= 5)
% of whole population	17	14	13	16
Age (years)	48.00 (15.29)	42.50 (12.59)	47.67 (9.50)	48.80 (10.15)
Sex	9 Females 4 Males	5 Females 3 Males	4 Females 2 Males	3 Females 2 Males
Pain duration (years)	4.44 (6.02)	5.00 (7.05)	5.50 (8.11)	6.40 (8.73)
Satisfaction - treatment	7.00 (2.24)	6.13 (2.47)	8.33 (0.82)	6.40 (3.65)
Satisfaction - ability to cope	Not measured	5.13 (1.96)	6.50 (3.02)	4.80 (3.42)
Satisfaction - current pain	Not measured	4.88 (3.04)	6.00 (3.52)	5.00 (2.83)
Pain intensity	6.00 (2.65)	5.25 (2.55)	5.67 (3.61)	7.40 (0.89)
Disability	10.00 (6.88)	8.25 (4.45)	6.83 (8.64)	9.40 (6.23)
Catastrophising	14.31 (9.53)	14.25 (13.63)	13.50 (18.85)	17.60 (18.34)
Depression	9.08 (5.41)	11.13 (7.90)	6.17 (6.71)	17.00 (11.94)
Self-efficacy	51.77 (20.85)	52.50 (17.73)	55.67 (20.29)	48.00 (21.13)
Kinesiophobia	22.38 (7.29)	21.13 (7.12)	17.33 (3.67)	19.80 (4.38)

In contrast to the defensive high-anxious and non-extreme group, the repressors reported higher self-efficacy, lower disability and cognitive factors at each time point (Table 7.3). They reported similar levels of pain intensity

and satisfaction as those reported by the defensive high-anxious and non-extreme groups (Tables 7.1 & 7.2).

7.3.2.4 High-anxious individuals

Table 7.4. Mean (±SD) for the high-anxious individuals at each time point.

	Baseline (n= 11)	3 month (n= 8)	6 month (n= 8)	12 month (n= 4)
% of whole population	14	14	17	13
Age (years)	44.00 (11.71)	46.50 (17.17)	46.50 (17.17)	43.75 (24.17)
Sex	8 Females 3 Males	6 Females 2 Males	6 Females 2 Males	3 Females 1 Males
Pain duration (years)	11.28 (8.79)	11.25 (11.67)	11.25 (11.67)	17.25 (14.36)
Satisfaction - treatment	5.80 (2.36)	4.75 (3.45)	4.88 (2.85)	3.75 (2.99)
Satisfaction - ability to cope	Not measured	3.88 (3.52)	3.00 (2.83)	2.75 (2.06)
Satisfaction - current pain	Not measured	4.88 (3.14)	4.63 (2.77)	4.00 (2.16)
Pain intensity	6.50 (1.04)	5.13 (2.85)	6.50 (2.45)	7.50 (1.00)
Disability	16.70 (6.26)	14.75 (7.15)	13.50 (8.65)	19.50 (3.87)
Catastrophising	25.73 (12.53)	26.75 (16.25)	21.25 (16.26)	24.75 (12.84)
Depression	31.18 (15.62)	26.88 (19.31)	27.13 (19.28)	26.00 (9.45)
Self-efficacy	34.64 (18.96)	34.38 (22.82)	35.25 (26.04)	20.50 (16.34)
Kinesiophobia	27.55 (5.73)	22.63 (5.78)	23.88 (7.92)	27.75 (8.85)

The high-anxious individuals reported that they were less satisfied with their treatment, ability to cope and current pain over the 12 months. Similarly to the non-extreme group, pain intensity, disability and cognitive factors varied over

time, with slight initial improvements at three months, then a decline from six to 12 months (Table 7.4).

7.3.2.5 Whole population

Table 7.5. Mean (±SD) for the whole population at each time point.

	Baseline (n= 79)	3 month (n= 58)	6 month (n= 47)	12 month (n= 30)
Age (years)	52.16 (15.26)	52.66 (16.03)	52.43 (15.52)	52.67 (15.86)
Sex	58 Females 21 Males	42 Females 16 Males	33 Females 14 Males	19 Females 11 Males
Pain duration (years)	9.20 (11.44)	9.65 (12.29)	9.41 (11.93)	11.65 (11.78)
Satisfaction - treatment	6.08 (2.72)	6.32 (3.07)	6.91 (2.76)	5.27 (2.53)
Satisfaction - ability to cope	Not measured	5.37 (3.02)	5.15 (3.09)	4.33 (2.47)
Satisfaction - current pain	Not measured	5.21 (2.85)	5.02 (3.17)	4.20 (2.62)
Pain intensity	6.04 (2.32)	5.59 (2.75)	5.72 (2.80)	5.97 (2.61)
Disability	15.08 (6.13)	13.52 (6.42)	13.32 (7.60)	13.90 (5.97)
Catastrophising	23.30 (13.82)	21.34 (14.31)	20.55 (14.54)	20.10 (13.55)
Depression	21.75 (13.39)	19.47 (12.91)	19.43 (14.79)	21.70 (12.58)
Self-efficacy	37.08 (21.16)	36.78 (22.79)	39.28 (23.31)	34.10 (20.88)
Kinesiophobia	25.47 (8.16)	24.38 (6.77)	24.47 (8.35)	25.13 (7.10)

If changes over time are looked at for the population as a whole (Table 7.5), the group differences, described in the preceding sections, are conflated and no significant improvements can be seen in any of the measures. When looking at the group as a whole they report declining satisfaction with

treatment, ability to cope with pain and increasing current pain intensity from three to 12 months.

7.3.3 Regression analysis

7.3.3.1 Preliminary examination of the data

None of the correlation coefficients exceeded 0.90, indicating the data were not affected by singularity. Durbin-Watson values were within acceptable limits for all regression analyses, suggesting that the assumption of independent errors was met. The predictor variables used in each of the regression analyses had variance inflation factors that were considerably less than 10 and tolerance levels that were higher than 0.2 indicating no problems with multicollinearity.

7.3.3.2 Analysis 1- predicting three-month disability from baseline cognitive factors in the whole population

As shown at baseline, age and pain duration were significantly related to levels of disability ($p< 0.05$) and explained 18% of the variance. In the second step, current pain intensity explained 21% of the variance in disability ($p< 0.05$). After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 41% ($p< 0.01$) of the variance in disability. Examination of the beta values (Table 7.6) revealed that similarly to baseline, younger age ($\beta= -0.35$, $p< 0.05$), longer pain duration ($\beta= 0.38$, $p< 0.05$), higher pain intensity ($\beta= 0.50$, $p< 0.05$) and depression ($\beta= 0.42$, $p< 0.05$) and lower self-efficacy ($\beta= -0.47$, $p< 0.05$), were related to greater levels of disability.

Table 7.6. Regression analysis of baseline factors predicting three-month disability within the whole population (n=58).

Step	R^2	R^2 change	F change	Standardised β	t
1. Demographics	0.18	0.18	3.99*		
Age				-0.35	-2.55*
Sex				-0.10	-0.75
Pain duration				0.38	2.86*
2. Pain intensity	0.39	0.21	18.57**	0.50	4.31
3. Cognitive factors	0.81	0.41	27.25**		
Catastrophising				-0.06	-0.73
Depression				0.42	3.95**
Self-efficacy				-0.47	-4.86**
Kinesiophobia				-0.00	-0.03

7.3.3.3 Analysis 2- predicting six-month disability from baseline cognitive factors in the whole population

Sex and pain duration were not related to disability, however, age was significantly related to levels of disability ($p< 0.05$) and explained 19% of the variance. In the second step, current pain intensity explained 21% of the variance in disability ($p< 0.05$). After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 39% ($p< 0.01$) of the variance in disability. Examination of the beta values (Table 7.7) revealed that younger age ($\beta= -0.37$, $p< 0.05$), higher pain intensity ($\beta= 0.47$, $p< 0.05$) and depression ($\beta= 0.42$, $p< 0.05$) and lower self-efficacy ($\beta= -0.32$, $p< 0.05$), were related to greater levels of disability.

Table 7.7. Regression analysis of baseline factors predicting six-month disability within the whole population (n= 47).

Step	R^2	R^2 change	F change	Standardised β	t
1. Demographics	0.19	0.19	3.50*		
Age				-0.34	-2.31*
Sex				0.00	0.01
Pain duration				0.42	2.87
2. Pain Intensity	0.41	0.21	15.06**	0.47	3.88
3. Cognitive factors	0.80	0.39	18.11**		
Catastrophising				0.15	1.26
Depression				0.42	3.20**
Self-efficacy				-0.32	-2.76**
Kinesiophobia				0.00	0.11

7.3.3.4 Analysis 3- predicting 12-month disability from baseline cognitive factors in the whole population

As seen at six months, sex and pain duration were not related to disability, whereas age (p< 0.05) explained a greater proportion (38%) of the variance than at the previous time points. In the second step, current pain intensity was not related to levels of disability at 12 months. After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 34% (p< 0.01) of the variance in disability. Examination of the beta values (Table 7.8) revealed that younger age (β= -0.63, p< 0.05), and depression (β= 0.38, p< 0.05) were related to greater levels of disability, however, pain intensity and self-efficacy were no longer shown to be significant.

Table 7.8. Regression analysis of baseline factors predicting 12-month disability within the whole population (n= 30).

Step		R^2	R^2 change	F change	Standardised β	t
1.	Demographics	0.38	0.38	5.41*		
	Age				-0.63	-3.75*
	Sex				0.29	1.83
	Pain duration				0.20	1.15
2.	Pain intensity	0.39	0.01	0.48	0.12	0.69
3.	Cognitive factors	0.70	0.34	6.70**		
	Catastrophising				-0.08	-0.55
	Depression				0.38	1.91*
	Self-efficacy				-0.21	-1.11
	Kinesiophobia				0.23	1.09

7.3.3.5 Analysis 4- predicting three-month disability from baseline cognitive factors in the defensive high-anxious group

As at baseline, age, sex and pain duration were not significantly related to levels of disability (p= 0.53). In contrast to the findings at baseline, current pain intensity explained 28% of the variance in disability (p< 0.01). After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 43% (p< 0.01) of the variance in disability. Examination of the beta values (Table 7.9) revealed that higher pain intensity (β= 0.62, p< 0.05) and kinesiophobia (β= 0.28, p< 0.05) and lower self-efficacy (β= -0.65, p< 0.05), were related to greater levels of disability. Compared to baseline, depression and catastrophising were no longer significantly linked.

Table 7.9. Regression analysis of baseline factors predicting three-month disability within the defensive high-anxious group (n=20).

Step		R^2	R^2 change	F change	Standardised β	t
1.	Demographics	0.18	0.18	1.18		
	Age				-0.21	-0.73
	Sex				-0.24	-0.90
	Pain duration				0.37	1.48
2.	Pain Intensity	0.68	0.28	7.92*	0.62	2.81
3.	Cognitive factors	0.89	0.43	11.41**		
	Catastrophising				-0.18	-1.22
	Depression				0.14	0.85
	Self-efficacy				-0.65	-3.90*
	Kinesiophobia				0.28	-2.33*

7.3.3.6 Analysis 5- predicting six-month disability from baseline cognitive factors in the defensive high-anxious group

As at three months, age, sex and pain duration were not significantly related to levels of disability (p= 0.52). In the second step, current pain intensity explained 32% of the variance in disability (p< 0.05). After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 42% (p< 0.05) of the variance in disability. Examination of the beta values (Table 7.10) revealed that higher pain intensity (β= 0.65, p< 0.05) and kinesiophobia (β= 0.49, p< 0.05) were related to greater levels of disability, however self-efficacy was no longer significantly linked.

Table 7.10. Regression analysis of baseline factors predicting six-month disability within the defensive high-anxious group (n= 16).

Step	R^2	R^2 change	F change	Standardised β	t
1. Demographics	0.16	0.16	0.78		
Age				-0.24	-0.70
Sex				-0.12	-0.30
Pain duration				0.37	1.23
2. Pain Intensity	0.48	0.32	6.67*	0.65	2.58
3. Cognitive factors	0.90	0.42	7.42*		
Catastrophising				-0.13	-0.82
Depression				0.29	1.22
Self-efficacy				-0.25	-1.12
Kinesiophobia				0.49	3.27*

7.3.3.7 Analysis 6- predicting three-month disability from baseline cognitive factors in the non-extreme group

Unlike within the defensive high-anxious group, age and pain duration were significantly related to levels of disability ($p < 0.05$) and explained 53% of the variance. Differing from the defensive high-anxious individuals, in the second step, current pain intensity was not related to levels of disability ($p = 0.27$). After controlling for the effects of demographics and pain intensity, the cognitive factors explained an additional 26% ($p < 0.05$) of the variance in disability. Examination of the beta values (Table 7.11) revealed as with the defensive high-anxious group, lower self-efficacy ($\beta = -0.41$, $p < 0.05$) was related to greater levels of disability but kinesiophobia was not. In contrast, to the defensive high-anxious individuals, for the non-extreme group, younger age ($\beta = -0.71$, $p < 0.05$) and higher pain duration ($\beta = 0.44$, $p < 0.05$) were associated with higher levels of disability.

Table 7.11. Regression analysis of baseline factors predicting three-month disability within the non-extreme group (n= 22).

Step		R^2	R^2 change	F change	Standardised β	t
1.	Demographics	0.53	0.53	6.82**		
	Age				-0.71	-4.27*
	Sex				-0.11	-0.65
	Pain duration				0.44	2.60*
2.	Pain intensity	0.56	0.03	1.26	0.28	1.12
3.	Cognitive factors	0.82	0.26	4.92**		
	Catastrophising				-0.21	-1.39
	Depression				0.14	0.52
	Self-efficacy				-0.41	-2.23*
	Kinesiophobia				0.21	1.02

7.3.3.8 Analysis 7- predicting six-month disability from baseline cognitive factors in the non-extreme group

Table 7.12 shows that in step 1, none of the demographic factors were significantly related to levels of disability. Similarly, in step 2 and 3, neither pain intensity nor the cognitive factors explained any of the variance in disability.

Table 7.12. Regression analysis of baseline factors predicting six-month disability within the non-extreme group (n= 17).

Step	R^2	R^2 change	F change	Standardised *β*	t
1. Demographics	0.45	0.45	3.56		
Age				-0.67	-2.99
Sex				0.15	0.70
Pain duration				0.41	1.80
2. Pain Intensity	0.52	0.06	1.63	0.40	1.28
3. Cognitive factors	0.87	0.35	5.32		
Catastrophising				0.46	0.67
Depression				-0.49	0.63
Self-efficacy				-1.62	-0.14
Kinesiophobia				1.43	0.19

7.3.4 Responders and non-responders

7.3.4.1 Pain intensity

A comparison of the baseline to three month and baseline to six month MCIC for pain intensity (improvement= -2 points) (Salaffi et al., 2004) is demonstrated in Figure 7.1 for the defensive high-anxious and non-extreme groups. Both the defensive high-anxious (25%) and the non-extreme group (23%) had similar levels of improvement in pain intensity from baseline to three months. In contrast, at six months, the defensive high-anxious group, demonstrated a greater proportion (38%) achieving a MCIC in pain intensity. Whereas within the non-extreme group, there was relatively little change with only 24% having a MCIC.

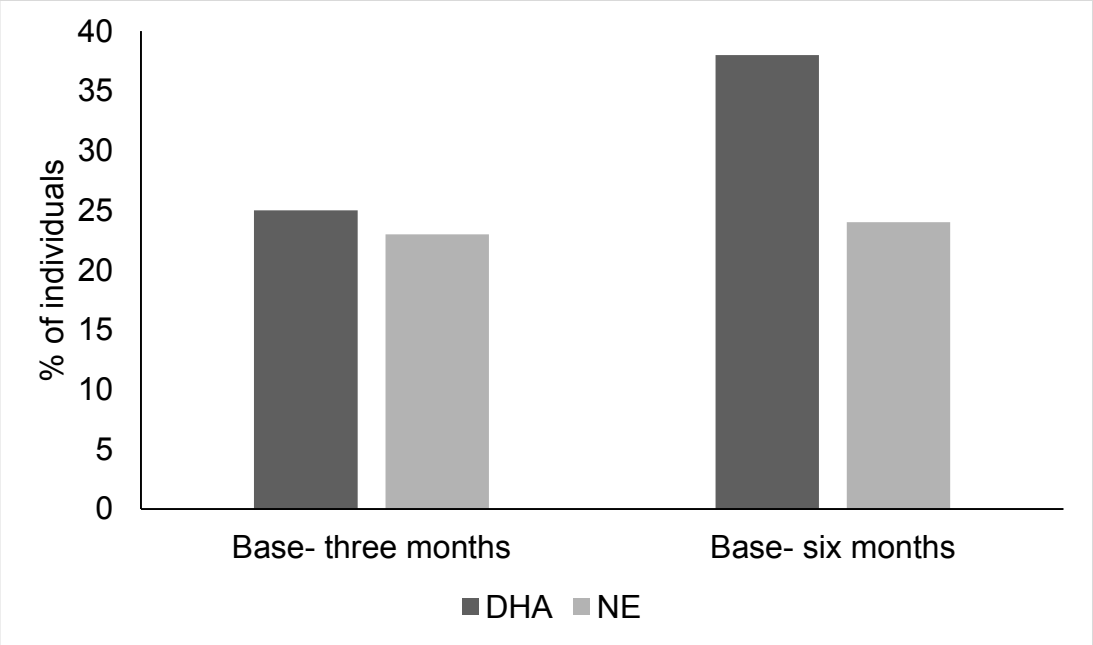

Figure 7.1. The percentage of individuals within each personality who reported MCIC in pain intensity from baseline to three months and six months (DHA= defensive high-anxious; NE= non-extreme).

7.3.4.2 Disability

A comparison of the baseline to three and six month MCIC for disability (improvement= -3 points) (Jordan et al., 2006) is demonstrated in Figure 7.2 for the defensive high-anxious and non-extreme groups. Of the defensive high-anxious individuals, 35% had lower disability at three months compared to baseline. In contrast, only 14% of the non-extreme individuals had a MCIC. The defensive high-anxious individuals continued to improve with 50% having a MCIC from baseline to six months. The non-extreme individuals continued to show little change with only 6% of the non-extreme individuals having lower disability at six months compared to baseline.

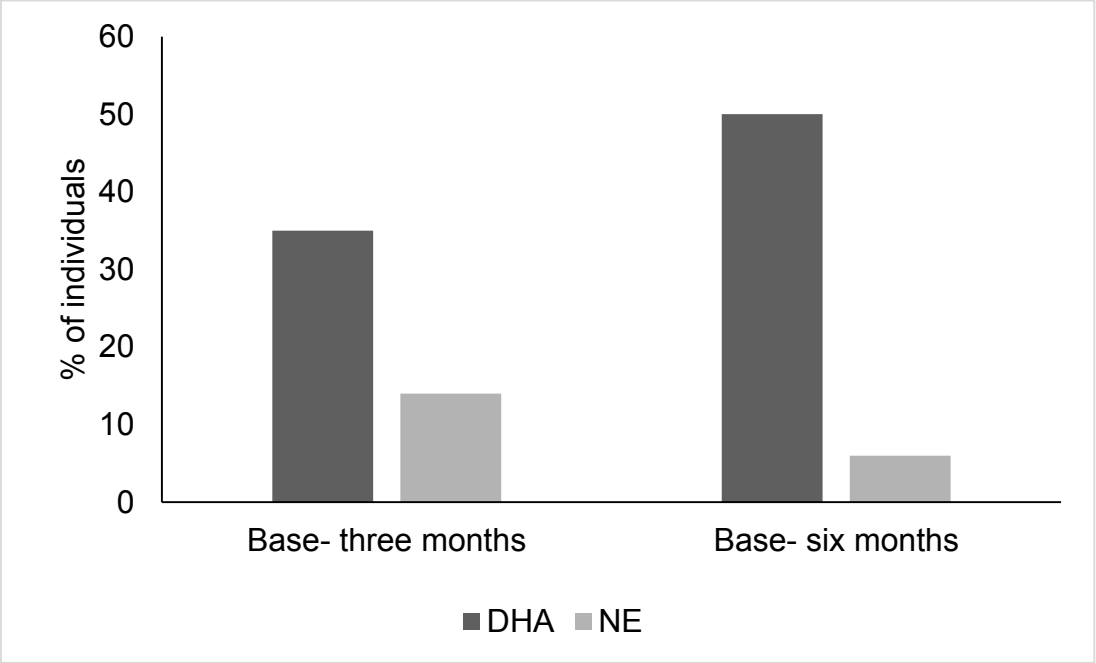

Figure 7.2. The percentage of individuals within each personality who have shown MCIC in disability from baseline to three months and six months (DHA= defensive high-anxious; NE= non-extreme).

7.4 Discussion

The aims of this study were: (i) to identify whether personality type affects the relationships between pain intensity, cognitive factors and disability at three and six months post baseline; and (ii) to identify whether personality type affects the likelihood of achieving a MCIC in pain intensity and disability at three and six months. The results from this study highlighted the importance of considering personality type in the management and assessment of chronic pain.

The majority of research within chronic pain populations has investigated the population as either a single homogenous group or stratified only on the basis of anxiety. There are inconsistencies between studies investigating the relationship between pain and disability. Some have shown that pain intensity only accounts for 0-10% of the variance in disability (Kamper et al., 2012; Waddell et al., 1992), whereas others have found pain intensity to be a stronger predictor (e.g., 24%) (Thompson et al., 2010; Woby et al., 2004b). The present study found that baseline pain intensity accounted for 21% of the variance in disability at three and six months when the population was looked at homogenously. When the population was split, based on anxiety and defensiveness, pain intensity was seen to have different effects on disability in the different groups. Within the defensive high-anxious group, pain intensity accounted for 28% of the variance in disability at three months, and 30% at six months. In contrast, within the non-extreme group, unlike at baseline, pain intensity was found to not predict disability at three or six months. This is of particular interest as many pain management programmes focus primarily on reducing participants' disability rather than their pain

intensity. Although pain intensity appears to be an important factor that may influence disability within the defensive high-anxious group, treatments aimed at pain relief are often unsuccessful, especially when the cause of pain cannot be identified (Ung et al., 2012). The greater importance of pain intensity within the defensive high-anxious group can be explained as a consequence of their attentional bias towards pain related information as shown in Chapter 5.

After controlling for demographic factors and pain intensity, the present study found that the cognitive factors had a different influence on disability depending on how the population was stratified. Within this study, the results for the whole population indicated that cognitive factors accounted for 41% and 39% of the variations in disability at three and six months respectively. In particular, higher levels of depression and lower levels of self-efficacy at baseline predicted three and six month disability. These findings support previous research that has shown a lack of belief in ability to cope with persistent pain, and higher depression, contribute to the development of disability in chronic pain patients (Arnstein et al., 1999; Linton, 2000; Pincus et al., 2002). Of particular interest in this study is the different influence of cognitive factors when the defensive high-anxious and non-extreme group are analysed separately. At three months, lower self-efficacy explains 24% of the variance in disability in the non-extreme group, whereas within the defensive high-anxious group the cognitive factors (lower self-efficacy and higher kinesiophobia) explain 43%. The significant influence of self-efficacy is consistent with previous research in chronic pain populations, which has identified self-efficacy to be a robust predictor for long term outcome for perceived disability (Rasmussen-Barr et al., 2012).

Conceptually, self-efficacy is related to Behaviourist Theory and refers to the way individuals set goals and the anticipation of outcome (Bandura, 1977). The extent to which patients are disabled by pain, may depend on their level of self-efficacy, whereby, patients with higher self-efficacy (e.g., repressors) may more easily find strategies to prevent further recurrences. Whereas individuals with lower self-efficacy may be more likely to avoid particular situations, a pattern which has been associated with helplessness and pessimistic thoughts (Benjaminsson et al., 2007; Denison et al., 2004). Defensive high-anxious individuals have previously been found to be more pessimistic about outcome in threatening situations than other personality types (Eysenck and Derakshan, 1997; Franklin et al., 2015), thereby reducing the likelihood that they will engage in physical activities, which they perceive will be harmful. In contrast to the pattern at baseline shown in the last chapter, kinesiophobia was found to influence disability at both three and six months within the defensive high-anxious group. In line with the fear-avoidance model, Woby et al. (2007) suggested that when there is a reduction in functional self-efficacy and higher fear of movement, individuals are more likely to avoid certain activities which ultimately leads to greater disability, disuse and depression. The fear-avoidance model suggest that how individuals interpret their pain will influence whether they carry on with daily activities or enter into a vicious cycle. This may be further exacerbated within the defensive high-anxious group as the results from the attentional bias study (Chapter 5), highlight that they are more likely to attend to threatening information. Graded exposure to activities which may be perceived as threatening or harmful, has been shown to be an effective treatment (Vlaeyen et al., 2001; Vlaeyen et al.,

2002). This type of intervention may be particularly beneficial for defensive high-anxious individuals, as their attentional and interpretive cognitive biases will be enhanced when levels of state anxiety are high. This may help clinicians to better target interventions and potentially decrease the rate of sick leave and influence adjustment to chronic pain, leading to lower healthcare utilisation (Jackson et al., 2014). The differences between the personality types highlight the need for defensiveness to be included in future assessments of individuals with chronic pain.

The primary goal of treatment is to see an improvement in patients' pain intensity and disability, resulting in an improvement in daily living. Numerous studies have investigated the MCIC to the patient (Beaton et al., 2002; Ostelo and de Vet, 2005; Wells et al., 2001), using standard outcome measures such as pain intensity and disability. A higher percentage of the defensive high-anxious individuals demonstrated an improvement in disability compared to the non-extreme group from baseline to three months (DHA= 35%; NE= 14%) and baseline to six months (DHA= 50%; NE= 6%). Interestingly, from baseline to three months, both the defensive high-anxious and the non-extreme groups had a similar percentage of individuals who improved in pain intensity (DHA= 25%; NE= 23%). From baseline to six months, the defensive high-anxious individuals continued to improve (DHA= 38%; NE= 24%), however there was no change for the non-extreme group. All of the individuals within this study had been receiving treatment at their treating hospital throughout the six month period. The distinct differences between the two groups have important implications for assessing the effectiveness of treatment. Based on the recommended outcome measures (Dworkin et al., 2008) used in this study, it

could be suggested that current treatment is more effective for defensive high-anxious individuals compared to the non-extreme group. Differentiating these two groups in future may allow for more targeted and cost-effective interventions.

Surprisingly, the defensive high-anxious individuals continued to reduce their reported level of pain intensity and disability from baseline to three and six months. Compared to the non-extreme group who had a low percentage of individuals reducing their pain intensity and disability over this time. The majority of studies investigating clinical interventions analyse group differences between treatment and control conditions, whereby it is assumed that if there is no difference in the means, or the mean is less than the MCIC then the treatment effect is unimportant. We can see that by stratifying the population by personality type, more of the defensive high-anxious individuals perceive an improvement compared to the non-extreme individuals. Current pain management programmes do not focus on directly reducing pain intensity but are based on cognitive-behavioural principles to improve coping strategies, potentially resulting in reductions in pain intensity and disability. Other cognitive elements such as depression, self-efficacy and kinesiophobia have been shown to influence pain behaviour and pain intensity (Linton, 2000), which are factors that, within this study, influence the disability of defensive high-anxious individuals over time.

One of the most important findings within this study is the distinct difference between the defensive high-anxious and non-extreme group in the percentage of individuals improving in disability. The defensive high-anxious group continued to report reduced levels of disability, whereas the non-

extreme group had fewer individuals reporting improvement. The non-extreme individuals did not have any significant changes in their cognitive factors, compared to the defensive high-anxious group who reported significant reductions in depression at both time points. Previous research has shown that changes in depression from pre- to post-treatment account for a significant amount of variance in changes in disability (Glombiewski et al., 2010). In addition, comorbid depression and chronic pain have been associated with more pain complaints, functional limitations and greater healthcare utilization (Bair et al., 2003; Linton, 2000). The defensive high-anxious individuals may be reporting lower depression and better outcome over time because as treatment progresses it is becoming effective by addressing cognitive factors and their defensiveness is partially protecting them from experiencing enhanced negative affect.

The majority of research investigating Weinberger et al.'s (1979) personality types in health research has focussed on repressor individuals. Repressors have been found to answer health related questionnaires in an overly positive fashion (Myers and Vetere, 1997) and in threatening situations will report low levels of distress, however, physiologically they are similar to defensive high-anxious individuals (Derakshan and Eysenck, 1997). Defensiveness is characterised as a general orientation away from threatening self-relevant information, and a denial of negative affect. It has been suggested that self-relevant information which is perceived as being inconsistent with personal goals and beliefs is likely to trigger defensive coping reactions (Croyle et al., 1997). For example, high defensive individuals may

unconsciously deceive themselves into believing treatment is improving their symptoms.

The interaction between varying levels of anxiety and defensiveness has a distinctly different influence upon cognitive biases towards threatening information. The combination of low anxiety and high defensiveness causes repressor individuals to fail to recognise their own affective responses. In addition, they employ various strategies to maintain low levels of negative affect and avoid conscious knowledge of their genuine reactions (e.g., physiological responses such as increased galvanic skin response) (Weinberger, 1990), which may explain why relatively few remain in the care system. In contrast, a high number of defensive high-anxious individuals were found within this population in a pain management programme. Within this thesis, there is a potential paradox within the defensive high-anxious individuals, who have been found to attend to pain related information, however, they report an improvement in their levels of disability. These responses can only be partially explained by the individual's cognitive biases, other factors include treatment, environment (e.g., family support) and behaviour. The current treatment (e.g., cognitive behavioural therapy/physiotherapy) could be more effective for defensive high-anxious individuals, which may explain why their reports of disability and pain reduced. Their improvement may have been quicker or more pronounced if they were not attending to their pain and experiencing negative affect, which in turn influenced their behaviour (e.g., avoidance of activities).

CHAPTER 8

8.0 Epilogue

8.1 Conclusions

This thesis investigated whether personality type influences clinical outcome in individuals with chronic pain and the mechanisms by which the combination of anxiety and defensiveness influence pain and disability. The main conclusions of this thesis are discussed in relation to the objectives originally stated in chapter two.

Objective 1: To identify the key factors that influence patient satisfaction in the management of chronic pain.

The qualitative patient interview study gave an insight into factors which affected patient satisfaction. These included factors such as clinician attitudes to their condition, how caring clinicians were and how well their condition was explained despite remaining in the care system. The longitudinal study identified that, over time, defensive high-anxious individuals were more satisfied with their treatment and ability to cope with pain compared to the high-anxious and non-extreme groups. These findings suggest that defensive high-anxious individuals are satisfied with the process of treatment, however, they may remain within the care system because they perceive the need for continuous support from clinicians and their greater attentional focus to pain related stimuli.

Objective 2: To establish the attentional biases of defensive high-anxious individuals to threatening stimuli in a chronic back pain population.

In Chapter 5, the dot probe study demonstrated that defensive high-anxious individuals have an attentional bias towards pain-related information. This finding may partially explain why defensive high-anxious individuals are more likely to remain in the care system. These individuals are more likely to attend to their painful symptoms and other pain-related information compared to the other groups, therefore, it would be expected that they would report higher disability and be referred through the care system. This study also identified differences between the high-anxious and defensive high-anxious individuals. The high-anxious individuals did not demonstrate the same attentional bias towards threatening information, suggesting that it would be beneficial to differentiate these individuals in their treatment programmes. The mechanisms behind the high-anxious and defensive high-anxious attention to pain related information were different, indicating that they may respond differently to management strategies.

Objective 3: To identify whether there are differences in the distribution of personality type between those with and without chronic pain.

In line with previous research, the findings from the third study (Chapter 6) identified that there was a significantly greater proportion of defensive high-anxious individuals within the patient population compared to that found in the asymptomatic control population. The higher percentage of defensive high-anxious individuals reflects their persistence within the care system. This highlights the need for earlier referral to PMPs for this group as other

interventions are unlikely to be successful for these individuals. Targeting treatments to meet their unique needs may be more beneficial for both the individual and the cost to the health service. The attentional bias towards pain in defensive high-anxious individuals would indicate the greater need for psychologically based interventions for this group.

Objective 4: To determine whether personality type affects the relationships between cognitive factors and both pain and disability.

Within both the cross-sectional and longitudinal studies differences were shown between the personality types in the influence of cognitive factors on the variation of disability over time. In particular, the cognitive factors had a greater influence upon disability within the defensive high-anxious group than for the non-extreme individuals. From a treatment perspective, these studies highlight the necessity of including defensiveness in initial assessment to more effectively target treatment, and to stratify the population when investigating changes over time.

Objective 5: To identify whether there are any differences between personality types in the minimally clinical important change from baseline to three and six months for pain and disability.

One of the most important findings arising from the study is the difference between the proportions of defensive high-anxious and non-extreme individuals reporting improvements in disability and pain.

A higher percentage of the defensive high-anxious individuals demonstrated an improvement in disability compared to the non-extreme

group between baseline and three months (DHA= 35%; NE= 14%) and six months (DHA= 50%; NE= 6%). Interestingly, from baseline to three months, both the defensive high-anxious and the non-extreme group had a similar percentage of individuals who improved in pain intensity (DHA= 25%; NE= 23%). From baseline to six months, the proportion of defensive high-anxious individuals reporting reduced pain continued to increase (DHA= 38%; NE= 24%), whereas there was no change for the non-extreme group. This difference between the defensive high-anxious and non-extreme groups has important implications for assessing the effectiveness of treatment. Disability and pain intensity are both commonly used as outcome measures to assess the effectiveness of treatment. Based on the results from this study it could be suggested that current treatments are more effective for defensive high-anxious individuals compared to the non-extreme patients. Furthermore, the higher proportion of defensive high-anxious individuals found within study 3, highlights the need for these interventions to be delivered earlier. Differentiating these two groups may allow for more targeted interventions, which could be more cost effective and reduce the number of patients remaining in the care system.

8.2 Limitations

Inevitably, the studies within this thesis have some limitations. Firstly, data in the third and fourth studies were based on self-report measures which are potentially subject to bias and shared method variance. This study, however, explored the role of cognitive factors, which can only be measured by self-report. Secondly, there was no objective measure of disability and studies relied solely on self-report measures. Every effort has been made to ensure

that validated and reliable self-report tools have been used to maximise the validity and reliability of the measures presented. Thirdly, the way participants were recruited may lead to self-selection bias, particularly in relation to participants remaining within the longitudinal study. At each time point the distribution of personality types remained relatively stable, suggesting that the sample were representative at each stage of analysis. In addition, the analysis minimises the adverse effect of drop-outs because data were retained and utilised from individuals until the point of withdrawal. A further limitation is the small number of repressors, high-anxious and low-anxious individuals within the questionnaire studies. This prevented a more detailed comparison between all personality types at each time point within the longitudinal study. A further consideration is the modest sample size within the regressions in chapters six and seven. Some caution should be taken in interpreting the results when the population is split based on personality type. A general rule is that approximately 10 cases per factor is an adequate sample size. However, the cognitive factors and the demographics were entered into the regression model together, which suggests that approximately 30 participants are required. Future research with larger initial sample sizes and randomised controlled trials would add greater weight to these findings. This will provide more confidence in the relationships between variables when the population is split based on personality type and allow for the researcher to infer causal mechanisms. Based on previous research, there is often a relatively low number of repressor and low-anxious individuals in particular, because they tend not to remain in the care system. Finally, key themes from the qualitative study were not presented to the interview participants for their confirmation or

feedback. Although, the themes to emerge from the study were similar to those found in previous studies, providing confidence in the outcomes.

8.3 Clinical Implications

There are a number of clinical implications which follow on from these findings. The main finding from this thesis was the difference between analysing the group homogenously or heterogeneously. By analysing the group as a whole, differences in the influence of cognitive factors on disability were masked. Clinicians should consider including screening for both defensiveness and trait anxiety within initial patient assessments in order to better target treatment services, in order to decrease costs for the health service.

There was a significantly higher proportion of defensive high-anxious individuals within the PMP population, suggesting that earlier parts of the care pathway failed for this group of patients. Which in turn, caused them to continue to present for treatment and to be referred on to tertiary care services. Considering defensive high-anxious individuals made up such a high proportion within the PMP, it was surprising that these individuals were more likely to report an improvement in their pain intensity and disability over the six month period than other groups. Factors within the environment may contribute to the persistence of defensive high-anxious individuals, however, it may be beneficial to accelerate this group into PMP based interventions. Furthermore, the defensive high-anxious group may benefit from interventions, which include attentional bias modification. Van Damme et al.'s (2010) motivational account of pain proposes that understanding attention to pain requires the motivational context to be taken into account. When pain

management becomes the patient's focus, attentional biases towards pain-related information may become enhanced, because the ultimate goal is to reduce levels of pain. The patient may worry about the future consequences of pain, try to avoid particular activities that cause pain and carefully monitor other signals. As a result of this enhanced attention to their pain, it is likely that the attentional processing of other information (e.g. tasks at work) is inhibited leading to a lower standard of performance and the individual experiencing feelings of inadequacy, possibly leading to higher levels of depression. If defensive high-anxious individuals are predisposed to attend to pain related information, this bias may be exacerbated as they continue to remain within the care system. Attentional bias modification and more specific goal setting may help to reduce the number of patients remaining within the care system. Attentional bias modification research is still developing and is only beginning to be included within pain research. The theoretical assumption of attentional bias modification is that negative biases play a crucial role in the onset and maintenance of clinical symptoms (Fox et al., 2014). Eysenck's (1997) Four-factor Theory proposes that defensive high-anxious individuals are more likely to attend to threatening stimuli in their environment, which in turn exacerbates or maintains fear and anxiety. Attentional bias modification for defensive high-anxious individuals may serve to not only reduce their attention to threatening information but, as a consequence, reduce their fear of movement. Furthermore, interventions should challenge the way in which patients interpret threatening stimuli as this may have an influence upon their reaction to particular activities.

In relation to the fear-avoidance model, graded exposure to activities has been shown to reduce fear of movement and improve self-efficacy with daily tasks. The central concept of these types of interventions is that patients believe that physical activity will cause (re)injury. When there is no somatic pathology that can be identified, patients respond to activities either by 'confrontation' or 'avoidance'. When there is attention to pain related stimuli (e.g., such as the defensive high-anxious individuals), patients will often avoid activities, thereby enhancing fear of movement, resulting in higher disability. In contrast, repressors have an avoidant bias of pain related stimuli and are more likely to confront activities and have been found to be better at self-managing their pain.

Current screening tools within clinical environments utilise a range of psychological markers, such as fear of movement (kinesiophobia), however, this analysis is based upon research within un-stratified populations. The studies within this thesis highlighted that the relationships between psychological factors and outcome differ between personality types. When the population is analysed as a whole, some of these differences may be masked. Furthermore, the differences between attentional biases suggest that some individuals are better able to avoid negative affect compared to others. The interest in attentional biases to pain is increasing within current research and clinical environments. Although attention to pain is important, a greater understanding of the role of interpretational and memory biases within attention to pain is required. The distinct differences between the personality types suggest that the current screening criteria for referrals is flawed and the treatment process may be improved if the population is stratified based on

personality type. By targeting interventions to particular personality types, this may result in greater improvements in quality of life and treatment outcome.

Currently, within clinical treatment settings, patient populations are frequently considered as undifferentiated groups. The findings from this thesis highlight that although there are some factors which can improve the treatment experience for everyone, it would be beneficial to stratify the population. By stratifying the population based on anxiety and defensiveness we were able to identify important differences in the associations between cognitive factors and outcome. In particular, cognitive behavioural and attention modification treatments may be more beneficial for defensive high-anxious compared to non-extreme individuals. Although the defensive high-anxious individuals did report an improvement in levels of disability and pain intensity, they had all been within the care system for a long period of time. If the population had been stratified when they first presented with the problem, they could have been referred earlier and this improvement may have been seen at an earlier stage. Cognitive behavioural treatments provide clear explanations in relation to negative cognitive biases and some strategies on how to eliminate them. Without tackling the underlying mechanisms behind these biases it is likely that these individuals will continue to attend to threatening information. If the population were stratified, defensive high-anxious individuals may benefit from a combination of cognitive behavioural treatment and bias modification. Furthermore, if clinicians are going to include assessment of personality type into the treatment environment it would seem important to develop a screening tool which will effectively identify personality type. By using this method it may

serve to give clinicians at primary, secondary and tertiary care a clearer path of referral, thereby reducing the number of incorrect appointments.

The non-extreme group in particular did not report an improvement in pain or disability compared to the defensive high-anxious individuals. The failure of the PMP for these non-extreme individuals does suggest the need to identify more effective interventions for these patients. The non-extreme group made up a significant proportion of the population within this thesis, and these individuals may account for some of the conflicting findings previously reported about the effectiveness of interventions. Current PMPs primarily focus on reducing levels of disability through cognitive behavioural principles, and do not focus on directly reducing pain intensity. Initial levels of pain intensity were more influential on the non-extreme group's levels of disability compared to cognitive factors. The mechanisms behind these factors need to be investigated further, in particular, the interpretation of their pain intensity may provide greater insights. In addition, the non-extreme group reported lower levels of satisfaction on all three measures (pain, treatment, ability to cope), suggesting that current treatment does not address these underlying issues. Further research needs to be done to identify the most effective treatment for this group of individuals.

The qualitative study highlighted some more general treatment factors, from which all patients would benefit. The patient interviews suggested that the treatment process and clinician interactions would influence the individual's ability to develop effective coping strategies and their satisfaction with treatment. Improving factors surrounding the treatment environment, may lead to an improved patient experience. In relation to the treatment process

and clinical interactions, the participants suggested that more information relating to their condition and coping strategies at an earlier stage of treatment may be more beneficial. Therefore, changing clinical practice guidelines to give short-term coping strategies may improve levels of satisfaction in all of the personality types.

One particular finding from the qualitative study is the suggestion of including a family support day within PMPs to give the patients' relatives or other carers/supporters a better understanding of the effect pain can have on the patient. Some hospital PMPs already include a support day, however it would be beneficial to include this as an essential element. Giving relatives an active involvement in the treatment programme may provide more support by relatives as they are made to feel included and a sense of justification in their input.

The clinical implications suggested within this thesis may help to improve current clinical practice guidelines and referral process to reduce the demands on health care services, resulting in more efficient and beneficial appointments and lower costs.

8.4 Directions for future research

There are several directions for future research that emerge from the outcomes of this thesis that would help inform the development of healthcare services. Future studies should aim to identify how treatment can best be differentiated for the different personality types to maximize treatment outcomes. In particular, if PMPs are offered to defensive high-anxious individuals earlier, whether this leads to a lower proportion re-presenting for

treatment and thus more cost effective care. Furthermore, levels of disability reported by defensive high-anxious individuals were influenced more by fear of movement and self-efficacy. Therefore, they may benefit from graded exposure to particular activities, which they perceive as threatening. Future studies should assess whether these interventions are more beneficial for defensive high-anxious individuals compared to current methods, and the mechanisms affecting outcome.

Secondly, the regression analyses within this thesis have demonstrated that there are important differences between the personality types. Follow-up studies are needed in order to understand the mechanisms behind these differences. It would be interesting for future studies to examine the ways in which the key cognitive factors influence treatment outcome over a longer period of time (e.g., 12-18 months). It is likely that we would see similar differences between the personality groups to the ones found in this thesis, however, it is necessary to recruit larger populations to enhance statistical power. Furthermore, within this thesis there were not enough high-anxious individuals to be able to run regression analyses on the data. Therefore, further research should recruit a larger patient population to be able to recruit these individuals and identify any differences.

Finally, the dot probe study highlighted some interesting differences between personality types. Analysing the eye gaze patterns of the four personality types, using contextually relevant images, may provide greater insight into what aspects of the images they are attending to (e.g., the back, or the activity the person is doing). Using an ecologically valid environment will allow for the assessment of both attentional and interpretive biases. In

addition, investigating the attentional biases of chronic back pain patients in situations of elevated anxiety may provide greater insight into why certain individuals remain within the care system. By giving particular instructions such as asking participants to view the images with an intention to imitate the observed action may provide greater insights into activities they are uncomfortable with and improve graded exposure treatments.

8.5 Global research conclusion

Based on the findings from this thesis it can be concluded that pain management programmes would be improved if treatment pathways were stratified based on personality type. This will allow clinicians to target interventions to address the attentional and interpretive biases of specific personality types. Not only would this benefit the quality of life for the individual but could also have a societal impact for the wider economy and the British National Health Service.

References

Adams, M. A. and Dolan, P. (2005) 'Spine biomechanics.' *Journal of Biomechanics*, 38(10) pp. 1972-1983.

Ainsworth, M. S. and Bowlby, J. (1991) 'An ethological approach to personality development.' *American Psychologist*, 46(4) pp. 333-341.

Airaksinen, O., Brox, J., Cedraschi, C. O., Hildebrandt, J., Klaber-Moffett, J., Kovacs, F., Mannion, A., Reis, S., Staal, J. and Ursin, H. (2006) 'Chapter 4 European guidelines for the management of chronic nonspecific low back pain.' *European Spine Journal*, 15 pp. s192-s300.

Anderson, K. O., Dowds, B. N., Pelletz, R. E., Thomas Edwards, W. and Peeters-Asdourian, C. (1995) 'Development and initial validation of a scale to measure self-efficacy beliefs in patients with chronic pain.' *Pain*, 63(1) pp. 77-83.

Arnstein, P., Caudill, M., Mandle, C. L., Norris, A. and Beasley, R. (1999) 'Self efficacy as a mediator of the relationship between pain intensity, disability and depression in chronic pain patients.' *Pain*, 80 pp. 483-491.

Arntz, A., Dreessen, L. and Merckelbach, H. (1991) 'Attention, not anxiety, influences pain.' *Behaviour Research and Therapy*, 29(1) pp. 41-50.

Ashina, S., Serrano, D., Lipton, R. B., Maizels, M., Manack, A. N., Turkel, C. C., Reed, M. L. and Buse, D. C. (2012) 'Depression and risk of transformation of episodic to chronic migraine.' *The Journal of Headache and Pain*, 13(8) pp. 615-624.

Asmundson, G. J. G., Carleton, N. R. and Ekong, J. (2005) 'Dot-probe evaluation of selective attentional processing of pain cues in patients with chronic headaches.' *Pain*, 114(1) pp. 250-256.

Asmundson, G. J. G., Wright, K. D. and Hadjistavropoulos, H. D. (2005) 'Hypervigilance and attentional fixedness in chronic musculoskeletal pain: consistency of findings across modified stroop and dot-probe tasks.' *Journal of Pain*, 6(8) pp. 497-506.

Bair, M. J., Robinson, R. L., Katon, W. and Kroenke, K. (2003) 'Depression and pain comorbidity: A literature review.' *Archives of Internal Medicine*, 163(20) pp. 2433-2445.

Bair, M. J., Wu, J., Damush, T. M., Sutherland, J. M. and Kroenke, K. (2008) 'Association of depression and anxiety alone and in combination with chronic musculoskeletal pain in primary care patients.' *Psychosomatic Medicine*, 70(8) pp. 890-897.

Bair, M. J., Poleshuck, E. L., Wu, J., Krebs, E. K., Damush, T. M., Tu, W. and Kroenke, K. (2013) 'Anxiety but not social stressors predict 12-month depression and pain severity.' *The Clinical Journal of Pain*, 29(2) pp. 95-101.

Bandura, A. (1977) 'Self-efficacy: toward a unifying theory of behavioral change.' *Psychological review*, 84(2) p. 191.

Bandura, A., Cioffi, D., Taylor, C. B. and Brouillard, M. E. (1988) 'Perceived self-efficacy in coping with cognitive stressors and opioid activation.' *Journal of Personality and Social Psychology*, 55(3) p. 479.

Bandura, A., O'Leary, A., Taylor, C. B., Gauthier, J. and Gossard, D. (1987) 'Perceived self-efficacy and pain control: opioid and nonopioid mechanisms.' *Journal of Personality and Social Psychology*, 53(3) p. 563.

Barke, A., Baudewig, J., Schmidt-Samoa, C., Dechent, P. and Kröner-Herwig, B. (2012) 'Neural correlates of fear of movement in high and low fear-avoidant chronic low back pain patients: an event-related fMRI study.' *Pain*, 153(3) pp. 540-552.

Barlow, J., Wright, C., Sheasby, J., Turner, A. and Hainsworth, J. (2002) 'Self-management approaches for people with chronic conditions: a review.' *Patient Education and Counseling*, 48(2) pp. 177-187.

Beaton, D. E., Boers, M. and Wells, G. A. (2002) 'Many faces of the minimal clinically important difference (MCID): a literature review and directions for future research.' *Current Opinion in Rheumatology*, 14(2) pp. 109-114.

Beattie, P., Dowda, M., Turner, C., Michener, L. and Nelson, R. (2005) 'Longitudinal continuity of care is associated with high patient satisfaction with physical therapy.' *Physical Therapy*, 85(10) pp. 1046-1052.

Beck, A. T., Emery, G. and Greenberg, R. L. (1985) *Anxiety Disorders and Phobias: A Cognitive Perspective.* New York: Basic Books.

Beecher, H. K. (1959) *Measurement of Subjective Responses.* New York: Oxford University Press.

Benjaminsson, O., Biguet, G., Arvidsson, I. and Nilsson-Wikmar, L. (2007) 'Recurrent low back pain: relapse from a patient perspective.' *Journal of Rehabilitation Medicine*, 39(8) pp. 640-645.

Bishop, M. D., Horn, M. E., Lott, D. J., Arpan, I. and George, S. Z. (2011) 'Magnitude of spinal muscle damage is not statistically associated with exercise-induced low back pain intensity.' *The Spine Journal*, 11(12) pp. 1135-1142.

Boersma, K. and Linton, S. J. (2005) 'How does persistent pain develop? An analysis of the relationship between psychological variables, pain and function

across stages of chronicity.' *Behavioural Research Therapy*, 43 pp. 1495-1507.

Boos, N., Rieder, R., Schade, V., Spratt, K. F., Semmer, N. and Aebi, M. (1995) 'The diagnostic accuracy of magnetic resonance imaging, work perception and psychosocial factors in identifying systematic disc herniations.' *Spine*, 20 pp. 2613-2625.

Boyd, K. M. (2000) 'Disease, illness, sickness, health, healing and wholeness: exploring some elusive concepts.' *Medical Humanities*, 26(1) pp. 9-17.

Bradley, B. P., Mogg, K. and Millar, N. H. (2000) 'Covert and overt orienting of attention to emotional faces in anxiety.' *Cognition and Emotion*, 14(6) pp. 789-808.

Bradley, B. P., Mogg, K., Falla, S. J. and Hamilton, L. R. (1998) 'Attentional bias for threatening facial expressions in anxiety: Manipulation of stimulus duration.' *Cognition and Emotion*, 12(6) pp. 737-753.

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology.' *Qualitative Research in Psychology*, 3(2) pp. 77-101.

Breivik, H., Collett, B., Ventafridda, V., Cohen, R. and Gallacher, D. (2006) 'Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment.' *European Journal of Pain*, 10(4) pp. 287-287.

British Pain Society. (2005) *GfK NOP Pain Survey*. [Online] [Accessed on 7th August] www.britishpainsociety.org

British Pain Society. (2013) *Guidance for Pain Management Programmes for adults* [Online] [Accessed on 8th July] http://www.britishpainsociety.org/book_pmp2013_main.pdf

Brosschot, J. F., de Ruiter, C. and Kindt, M. (1999) 'Processing bias in anxious subjects and repressors, measured by emotional Stroop interference and attentional allocation.' *Personality and Individual Differences*, 26(5) pp. 777-793.

Buer, N. and Linton, S. J. (2002) 'Fear-avoidance beliefs and catastrophizing: occurrence and risk factor in back pain and ADL in the general population.' *Pain*, 99(3) pp. 485-491.

Bunzli, S., Watkins, R., Smith, A., Schütze, R. and O'Sullivan, P. (2013) 'Lives on hold: A qualitative synthesis exploring the experience of chronic low-back pain.' *The Clinical Journal of Pain*, 29(10) pp. 907-916.

Burns, J. W. (2000) 'Repression predicts outcome following multidisciplinary treatment of chronic pain.' *Health Psychology*, 19(1) p. 75.

Burns, J. W., Kubilus, A., Bruehl, S., Harden, R. N. and Lofland, K. (2003) 'Do changes in cognitive factors influence outcome following multidisciplinary treatment for chronic pain? A cross-lagged panel analysis.' *Journal of Consulting and Clinical Psychology*, 71(1) p. 81.

Butler, R. J. and Johnson, W. G. (2008) 'Satisfaction with low back pain care.' *The Spine Journal*, 8(3) pp. 510-521.

Calvino, B. and Grilo, R. M. (2006) 'Central pain control.' *Joint Bone Spine*, 73(1) pp. 10-16.

Calvo, M. G. and Eysenck, M. W. (2000) 'Early vigilance and late avoidance of threat processing: Repressive coping versus low/high anxiety.' *Cognition & Emotion*, 14(6) pp. 763-787.

Camacho-Soto, A., Sowa, G. A., Perera, S. and Weiner, D. K. (2012) 'Fear avoidance beliefs predict disability in older adults with chronic low back pain.' *PM&R*, 4(7) pp. 493-497.

Campbell, C. and Guy, A. (2007) 'Why can't they do anything for a simple back problem?A qualitative examination of expectations for low back pain treatment and outcome.' *Journal of Health Psychology*, 12(4) pp. 641-652.

Campbell, C., McCauley, L., Bounds, S., Conn, L., Simango, M., Edwards, R. and Fontaine, K. (2012) 'Changes in pain catastrophizing predict later changes in fibromyalgia clinical and experimental pain report: Cross-lagged panel analyses of traditional and situational catastrophizing.' *Journal of Pain*, 13(4) pp. 1-9.

Carroll, L. J., Cassidy, J. D. and Cote, P. (2004) 'Depression as a risk factor for onset of an episode of troublesome neck and low back pain.' *Pain*, 107 pp. 134-139.

Caspers, S., Zilles, K., Laird, A. R. and Eickhoff, S. B. (2010) 'ALE meta-analysis of action observation and imitation in the human brain.' *Neuroimage*, 50(3) pp. 1148-1167.

Casserley-Feeney, S. N., Phelan, M., Duffy, F., Roush, S., Cairns, M. C. and Hurley, D. A. (2008) 'Patient satisfaction with private physiotherapy for musculoskeletal pain.' *BMC Musculoskeletal Disorders*, 9(1) p. 50.

Cherkin, D. C., Deyo, R. A., Street, J. H. and Barlow, W. (1996) 'Predicting poor outcomes for back pain seen in primary care using patients' own criteria.' *Spine*, 21(24) pp. 2900-2907.

Chewning, B., Bylund, C. L., Shah, B., Arora, N. K., Gueguen, J. A. and Makoul, G. (2012) 'Patient preferences for shared decisions: a systematic review.' *Patient Education and Counseling*, 86(1) pp. 9-18.

Clare, A., Andiappan, M., MacNeil, S., Bunton, T. and Jarrett, S. (2013) 'Can a pain management programme approach reduce healthcare use? Stopping the revolving door.' *British Journal of Pain*, p. 2049463713484907.

Collett, B. J., Betteridge, N., Semmons, N. and Trueman, P. (2010) *Pain Proposal improving the current and future management of chronic pain UK.*: [Online] [Accessed on 4th January] http://www.arthritiscare.org.uk/PublicationsandResources/Listedbytype/Reports/Otherreports

Cooper, K., Smith, B. H. and Hancock, E. (2008) 'Patient-centredness in physiotherapy from the perspective of the chronic low back pain patient.' *Physiotherapy*, 94 pp. 244-252.

Costa, L. C., Maher, C. G., McAuley, J. H., Hancock, M. J. and Smeets, R. J. E. M. (2011) 'Self-efficacy is more important than fear of movement in mediating the relationship between pain and disability in chronic low back pain.' *European Journal of Pain*, 94 pp. 244-252.

Cousin, G., Schmid Mast, M., Roter, D. L. and Hall, J. A. (2012) 'Concordance between physician communication style and patient attitudes predicts patient satisfaction.' *Patient Education and Counseling*, 87(2) pp. 193-197.

Covic, T., Adamson, B., Spencer, D. and Howe, G. (2003) 'A biopsychosocial model of pain and depression in rheumatoid arthritis: a 12-month longitudinal study.' *Rheumatology*, 42(11) pp. 1287-1294.

Creswell, C. and Chalder, C. (2001) 'Defensive coping styles in chronic fatigue syndrome.' *Journal of Psychosomatic Research*, 51 pp. 607-610.

Crombez, G., Hermans, D. and Adriaensen, H. (2000) 'The emotional stroop task and chronic pain: what is threatening for chronic pain sufferers?' *European Journal of Pain*, 4(1) pp. 37-44.

Crombez, G., Van Damme, S. and Eccleston, C. (2005) 'Hypervigilance to pain: an experimental and clinical analysis.' *Pain*, 116 pp. 4-7.

Crombez, G., Van Ryckeghem, D. M. L., Eccleston, C. and Van Damme, S. (2013) 'Attentional bias to pain-related information: a meta-analysis.' *Pain*, 154(4) pp. 497-510.

Crombez, G., Eccleston, C., Van den, B. A., Goubert, L. and Van Houdenhove, B. (2004) 'Hypervigilance to pain in fibromyalgia: the mediating role of pain intensity and catastrophic thinking about pain.' *The Clinical Journal of Pain*, 20(2) pp. 98-102.

Crombez, G., Eccleston, C., Van Damme, S., Vlaeyen, J. W. S. and Karoly, P. (2012) 'Fear-avoidance model of chronic pain: the next generation.' *The Clinical Journal of Pain*, 28(6) pp. 475-483.

Crombez, G., Viane, I., Eccleston, C., Devulder, J. and Goubert, L. (2013) 'Attention to pain and fear of pain in patients with chronic pain.' *Journal of Behavioral Medicine*, 36(4) pp. 371-378.

Crowne, D. P. and Marlowe, D. (1960) 'A new scale of social desirability independent of psychopathology.' *Journal of Consulting Psychology*, 24(4) pp. 349-354.

Croyle, R. T., Sun, Y. and Hart, M. (1997) 'Processing risk factor information: Defensive biases in health-related judgments and memory.' *In* Petrie, K. and Weinman, J. (eds.) *Perceptions of health and illness: Current research and applications*. London: Harwood Academic, pp. 267–290.

de Gier, M., Peters, M. L. and Vlaeyen, J. W. (2003) 'Fear of pain, physical performance, and attentional processes in patients with fibromyalgia.' *Pain*, 104(1) pp. 121-130.

De Souza, L. and Frank, A. O. (2011) 'Patients' experiences of the impact of chronic back pain on family life and work.' *Disability and Rehabilitation*, 33(4) pp. 310-318.

de Vries, H. J., Reneman, M. F., Groothoff, J. W., Geertzen, J. H. and Brouwer, S. (2013) 'Self-reported work ability and work performance in workers with chronic nonspecific musculoskeletal pain.' *Journal of Occupational Rehabilitation*, 23(1) pp. 1-10.

Dear, B. F., Sharpe, L., Nicholas, M. K. and Refshauge, K. (2011) 'Pain-related attentional biases: The importance of the personal relevance and ecological validity of stimuli.' *The Journal of Pain*, 12(6) pp. 625-632.

Dehghani, M., Sharpe, L. and Nicholas, M. K. (2003) 'Selective attention to pain-related information in chronic musculoskeletal pain patients.' *Pain*, 105(1) pp. 37-46.

Dehghani, M., Sharpe, L. and Nicholas, M. K. (2004) 'Modification of attentional biases in chronic pain patients: a preliminary study.' *European Journal of Pain*, 8(6) pp. 585-594.

Denison, E., Åsenlöf, P. and Lindberg, P. (2004) 'Self-efficacy, fear avoidance, and pain intensity as predictors of disability in subacute and chronic musculoskeletal pain patients in primary health care.' *Pain*, 111(3) pp. 245-252.

Denollet, J. (1991) 'Negative affectivity and repressive coping: pervasive influence on self-reported mood, health, and coronary-prone behavior.' *Psychosomatic Medicine*, 53(5) pp. 538-556.

Denollet, J., Martens, E. J., Nyklíček, I., Conraads, V. M. and de Gelder, B. (2008) 'Clinical events in coronary patients who report low distress: adverse effect of repressive coping.' *Health Psychology*, 27(3) p. 302.

Derakshan, N. and Eysenck, M. W. (1997) 'Interpretive biases for one's own behavior and physiology in high-trait-anxious individuals and repressors.' *Journal of Personality and Social Psychology*, 73(4) p. 816.

Derakshan, N. and Eysenck, M. W. (2001a) 'Manipulation of focus of attention and its effects on anxiety in high-anxious individuals and repressors.' *Anxiety, Stress and Coping*, 14(2) pp. 173-191.

Derakshan, N. and Eysenck, M. W. (2001b) 'Effects of focus of attention on physiological, behavioural, and reported state anxiety in repressors, low-anxious, high-anxious, and defensive high-anxious individuals.' *Anxiety, Stress and Coping*, 14(3) pp. 285-299.

Derakshan, N., Eysenck, M. W. and Myers, L. B. (2007) 'Emotional information processing in repressors: The vigilance–avoidance theory.' *Cognition and Emotion*, 21(8) pp. 1585-1614.

Derakshan, N., Salt, M. and Koster, E. H. W. (2009) 'Attentional control in dysphoria: An investigation using the antisaccade task.' *Biological Psychology*, 80(2) pp. 251-255.

Dewar, A. L., Gregg, K., White, M. I. and Lander, J. (2009) 'Navigating the health care system: perceptions of patients with chronic pain.' *Chronic Diseases in Canada*, 29(4) pp. 162-168.

Digman, J. M. (1990) 'Personality structure: Emergence of the five-factor model.' *Annual Review of Psychology*, 41(1) pp. 417-440.

Donaldson, C., Lam, D. and Mathews, A. (2007) 'Rumination and attention in major depression.' *Behaviour Research and Therapy*, 45(11) pp. 2664-2678.

Dworkin, R. H., Jensen, M. P., Gould, E., Jones, B. A., Xiang, Q., Galer, B. S. and Gammaitoni, A. R. (2011) 'Treatment satisfaction in osteoarthritis and chronic low back pain: the role of pain, physical and emotional functioning, sleep, and adverse events.' *The Journal of Pain*, 12(4) pp. 416-424.

Dworkin, R. H., Turk, D. C., Farrar, J. T., Haythornthwaite, J. A., Jensen, M. P., Katz, N. P., Kerns, R. D., Stucki, G., Allen, R. R. and Bellamy, N. (2005) 'Core outcome measures for chronic pain clinical trials: IMMPACT recommendations.' *Pain*, 113(1) pp. 9-19.

Dworkin, R. H., Turk, D. C., Wyrwich, K. W., Beaton, D., Cleeland, C. S., Farrar, J. T., Haythornthwaite, J. A., Jensen, M. P., Kerns, R. D. and Ader, D. N. (2008) 'Interpreting the clinical importance of treatment outcomes in chronic pain clinical trials: IMMPACT recommendations.' *The Journal of Pain*, 9(2) pp. 105-121.

Edwards, R. R., Bingham, C. O., Bathon, J. and Haythornthwaite, J. A. (2006) 'Catastrophizing and pain in arthritis, fibromyalgia, and other rheumatic diseases.' *Arthritis Care & Research*, 55(2) pp. 325-332.

Edwards, R. R., Cahalan, C., Mensing, G., Smith, M. and Haythornthwaite, J. A. (2011) 'Pain, catastrophizing, and depression in the rheumatic diseases.' *Nature Reviews Rheumatology*, 7(4) pp. 216-224.

Elfant, E., Burns, J. W. and Zeichner, A. (2008) 'Repressive coping style and suppression of pain-related thoughts: Effects on responses to acute pain induction.' *Cognition and Emotion*, 22(4) pp. 671-696.

Elfving, B., Andersson, T. and Grooten, W. J. (2007) 'Low levels of physical activity in back pain patients are associated with high levels of fear-avoidance beliefs and pain catastrophizing.' *Physiotherapy Research International*, 12(1) pp. 14-24.

Epp, A. M., Dobson, K. S., Dozois, D. J. and Frewen, P. A. (2012) 'A systematic meta-analysis of the Stroop task in depression.' *Clinical Psychology Review*, 32(4) pp. 316-328.

Eysenck, M. W. (1992) *Anxiety: The cognitive perspective.* London: Lawrence Erlbaum Associates Ltd.

Eysenck, M. W. (1997) *Anxiety and Cognition: A Unified Theory.* Hove: Psychology Press.

Eysenck, M. W. (2000) 'A cognitive approach to trait anxiety.' *European Journal of Personality*, 14(5) pp. 463-476.

Eysenck, M. W. and Derakshan, N. (1997) 'Cognitive biases for future negative events as a function of trait anxiety and social desirability.' *Personality and Individual Differences*, 22(5) pp. 597-605.

Eysenck, M. W., MacLeod, C. and Mathews, A. (1987) 'Cognitive functioning and anxiety.' *Psychological Research*, 49(2-3) pp. 189-195.

Fahrenberg, J. (1992) 'Psychophysiology of neuroticism and emotionality.' *In* Eysenck, M. W. and Gale, A. (eds.) *Handbook of individual differences: Biological perspectives*. Chichester: Wiley,

Faul, F., Erdfelder, E., Buchner, A. and Lang, A.-G. (2009) 'Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses.' *Behavior Research Methods*, 41(4) pp. 1149-1160.

Fields, H. L. (2000) 'Pain modulation: expectation, opioid analgesia and virtual pain.' *Progressive Brain Research*, 122 pp. 245-253.

Fitzpatrick, R. (1991) 'Surveys of patient satisfaction. 1: Important general considerations.' *British Medical Journal*, 302 pp. 887-889.

Fitzpatrick, R. M. and Hopkins, A. (1981) 'Patients' satisfaction with communication in neurological outpatient clinics.' *Journal of Psychosomatic Research*, 25(5) pp. 329-334.

Flett, G. L., Hewitt, P. L. and Dyck, D. G. (1989) 'Self-oriented perfectionism, neuroticism and anxiety.' *Personality and Individual Differences*, 10(7) pp. 731-735.

Fox, E. (1993) 'Allocation of visual attention and anxiety.' *Cognition & Emotion*, 7(2) pp. 207-215.

Fox, E. (2002) 'Processing emotional facial expressions: The role of anxiety and awareness.' *Cognitive, Affective, & Behavioral Neuroscience*, 2(1) pp. 52-63.

Fox, E., Mackintosh, B. and Holmes, E. A. (2014) 'Travellers' tales in cognitive bias modification research: A commentary on the special issue.' *Cognitive Therapy and Research*, 38(2) pp. 239-247.

Franklin, Z. C., Smith, N. C. and Fowler, N. E. (2014) 'Defensive high-anxious individuals with chronic back pain demonstrate different treatment choices and patient persistence.' *Personality and Individual Differences*, 64 pp. 84-88.

Franklin, Z. C., Smith, N. C. and Holmes, P. S. (2015) 'Anxiety symptom interpretation and performance expectations in high-anxious, low-anxious, defensive high-anxious and repressor individuals.' *Personality and Individual Differences*, 77 pp. 27-32.

Frasure-Smith, N., Lespérance, F., Gravel, G., Masson, A., Juneau, M. and Bourassa, M. G. (2002) 'Long-term survival differences among low-anxious, high-anxious and repressive copers enrolled in the Montreal heart attack readjustment trial.' *Psychosomatic Medicine*, 64(4) pp. 571-579.

Fritz, J. M., Beneciuk, J. M. and George, S. Z. (2011) 'Relationship between categorization with the STarT Back Screening Tool and prognosis for people receiving physical therapy for low back pain.' *Physical Therapy*, 91(5) pp. 722-732.

George, S. Z. and Hirsh, A. T. (2005) 'Distinguishing patient satisfaction with treatment delivery from treatment effect: a preliminary investigation of patient satisfaction with symptoms after physical therapy treatment of low back pain.' *Archives of Physical Medical Rehabilitation*, 86 pp. 1338-1344.

George, S. Z., Dannecker, E. A. and Robinson, M. E. (2006) 'Fear of pain, not pain catastrophizing, predicts acute pain intensity, but neither factor predicts tolerance or blood pressure reactivity: An experimental investigation in pain-free individuals.' *European Journal of Pain*, 10(5) pp. 457-457.

Gheldof, E. L., Crombez, G., Bussche, E., Vinck, J., Nieuwenhuyse, A., Moens, G., Mairiaux, P. and Vlaeyen, J. W. (2010) 'Pain-related fear predicts disability, but not pain severity: A path analytic approach of the fear-avoidance model.' *European Journal of Pain*, 14(8) pp. 870. e871-870. e879.

Glombiewski, J. A., Hartwich-Tersek, J. and Rief, W. (2010) 'Depression in chronic back pain patients: prediction of pain intensity and pain disability in cognitive-behavioral treatment.' *Psychosomatics*, 51(2) pp. 130-136.

Gordon, K. a. R., H., Allcock, N., Bell, P., Dunbar, M., Gilbert, S. and Wallace, H. (2015) 'Barriers to self-management of chronic pain in primary- a research project by the charity Pain Concern.' *Pain News*, 13(2) pp. 127-132.

Graves, J. M., Fulton-Kehoe, D., Jarvik, J. G. and Franklin, G. M. (2014) 'Health care utilization and costs associated with adherence to clinical practice guidelines for early magnetic resonance imaging among workers with acute occupational low back pain.' *Health Services Research*, 49(2) pp. 645-665.

Griffin, D. W., Harmon, D. and Kennedy, N. (2012) 'Do patients with chronic low back pain have an altered level and/or pattern of physical activity compared to healthy individuals? A systematic review of the literature.' *Physiotherapy*, 98(1) pp. 13-23.

Grotle, M., Foster, N. E., Dunn, K. M. and Croft, P. (2010) 'Are prognostic indicators for poor outcome different for acute and chronic low back pain consulters in primary care?' *Pain*, 151(3) pp. 790-797.

Gudjonsson, G. H. (1981) 'Self-reported emotional disturbance and its relation to electrodermal reactivity, defensiveness and trait anxiety.' *Personality and Individual Differences*, 2(1) pp. 47-52.

Guest, G., MacQueen, K. M. and Namey, E. E. (2012) *Applied thematic analysis.* Thousand Oaks, CA: Sage.

Hart, L. G., Deyo, R. A. and Cherkin, D. C. (1995) 'Physician office visits for low back pain. Frequency, clinical evaluation, and treatment patterns from a U.S. national survey.' *Spine*, 20(1) pp. 11-19.

Hasenbring, M., Hallner, D. and Klasen, B. (2001) 'Psychological mechanisms in the transition from acute to chronic pain: over-or underrated?' *Schmerz* 15(6) pp. 442-447.

Haythornthwaite, J. A., Seiber, W. J. and Kerns, R. D. (1991) 'Depression and the chronic pain experience.' *Pain*, 46 pp. 177-184.

Hazard, R. G., Haugh, L. D., Green, P. A. and Jones, P. L. (1994) 'Chronic low back pain: the relationship between patient satisfaction and pain, impairment, and disability outcomes.' *Spine*, 19(8) pp. 881-887.

Henschke, N., Wouda, L., Maher, C. G., Hush, J. M. and van Tulder, M. W. (2013) 'Determinants of patient satisfaction 1 year after presenting to primary care with acute low back pain.' *The Clinical Journal of Pain*, 29(6) pp. 512-517.

Hill, J. C., Dunn, K. M., Lewis, M., Mullis, R., Main, C. J., Foster, N. E. and Hay, E. M. (2008) 'A primary care back pain screening tool: identifying patient subgroups for initial treatment.' *Arthritis Care & Research*, 59(5) pp. 632-641.

Hill, J. C., Whitehurst, D. G., Lewis, M., Bryan, S., Dunn, K. M., Foster, N. E., Konstantinou, K., Main, C. J., Mason, E. and Somerville, S. (2011) 'Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial.' *The Lancet*, 378(9802) pp. 1560-1571.

Hills, R. and Kitchen, S. (2007) 'Satisfaction with outpatient physiotherapy: focus groups to explore the views of patients with acute and chronic musculoskeletal conditions.' *Physiotherapy Theory and Practice*, 23(1) pp. 1-20.

Hirsh, A. T., George, S. Z., Bialosky, J. E. and Robinson, M. E. (2008) 'Fear of pain, pain catastrophizing, and acute pain perception: relative prediction and timing of assessment.' *The Journal of Pain*, 9(9) pp. 806-812.

Hirsh, A. T., Atchison, J. W., Berger, J. J., Waxenberg, L. B., Lafayette-Lucey, A., Bulcourf, B. B. and Robinson, M. E. (2005) 'Patient satisfaction with treatment for chronic pain predictors and relationships to compliance.' *The Clinical Journal of Pain*, 21(4) pp. 302-310.

Hoffman, B. M., Papas, R. K., Chatkoff, D. K. and Kerns, R. D. (2007) 'Meta-analysis of psychological interventions for chronic low back pain.' *Health Psychology*, 26(1) pp. 1-9.

Holtgraves, T. and Hall, R. (1995) 'Repressors: What do they repress and how do they repress it?' *Journal of Research in Personality*, 29(3) pp. 306-317.

Hou, R., Moss-Morris, R., Bradley, B. P., Peveler, R. and Mogg, K. (2008) 'Attentional bias towards health-threat information in chronic fatigue syndrome.' *Journal of Psychosomatic Research*, 65(1) pp. 47-50.

Hudspith, M. J., Siddall, P. J. and Munglani, R. (2006) 'Physiology of Pain.' *In* Hemmings, H. C. and Hopkins, P. M. (eds.) *Foundations of Anesthesia*. China: Elsevier Mosby,

Hush, J. M., Cameron, K. and Mackey, M. (2011) 'Patient satisfaction with musculoskeletal physical therapy care: a systematic review.' *Physical Therapy*, 91 pp. 25-36.

Ioannou, M. C., Mogg, K. and Bradley, B. P. (2004) 'Vigilance for threat: effects of anxiety and defensiveness.' *Personality and Individual Differences*, 36(8) pp. 1879-1891.

Jackson, T., Wang, Y., Wang, Y. and Fan, H. (2014) 'Self-Efficacy and Chronic Pain Outcomes: A Meta-Analytic Review.' *The Journal of Pain*, 15(8) pp. 800-814.

Jensen, I. B., Bergström, G., Ljungquist, T. and Bodin, L. (2005) 'A 3-year follow-up of a multidisciplinary rehabilitation programme for back and neck pain.' *Pain*, 115(3) pp. 273-283.

Jensen, M. P., Turner, J. A. and Romano, J. M. (1994) 'Correlates of improvement in multidisciplinary treatment of chronic pain.' *Journal of Consulting and Clinical Psychology*, 62(1) p. 172.

Jensen, M. P., Turner, J. A. and Romano, J. M. (2001) 'Changes in beliefs, catastrophizing, and coping are associated with improvement in multidisciplinary pain treatment.' *Journal of Consulting and Clinical Psychology*, 69(4) p. 655.

Jensen, M. P., Turner, J. A. and Romano, J. M. (2007) 'Changes after multidisciplinary pain treatment in patient pain beliefs and coping are associated with concurrent changes in patient functioning.' *Pain*, 131(1) pp. 38-47.

Jensen, M. P., Strom, S. E., Turner, J. A. and Romano, J. M. (1992) 'Validity of the Sickness Impact Profile Roland scale as a measure of dysfunction in chronic pain patients.' *Pain*, 50(2) pp. 157-162.

Jones, K. A., Smith, N. C. and Holmes, P. S. (2004) 'Anxiety symptom interpretation and performance predictions in high-anxious, low-anxious and repressor sport performers.' *Anxiety, Stress & Coping*, 17(2) pp. 187-199.

Jordan, K., Dunn, K. M., Lewis, M. and Croft, P. (2006) 'A minimal clinically important difference was derived for the Roland-Morris Disability Questionnaire for low back pain.' *Journal of Clinical Epidemiology*, 59(1) pp. 45-52.

Kamper, S. J., Maher, C. G., Costa, L. d. C. M., McAuley, J. H., Hush, J. M. and Sterling, M. (2012) 'Does fear of movement mediate the relationship between pain intensity and disability in patients following whiplash injury? A prospective longitudinal study.' *Pain*, 153(1) pp. 113-119.

Keefe, F. J., Brown, G. K., Wallston, K. A. and Caldwell, D. S. (1989) 'Coping with rheumatoid arthritis pain: catastrophizing as a maladaptive strategy.' *Pain*, 37(1) pp. 51-56.

Keogh, E., Ellery, D., Hunt, C. and Hannent, I. (2001) 'Selective attentional bias for pain-related stimuli amongst pain fearful individuals.' *Pain*, 91(1) pp. 91-100.

Khatibi, A., Dehghani, M., Sharpe, L., Asmundson, G. J. and Pouretemad, H. (2009) 'Selective attention towards painful faces among chronic pain patients: evidence from a modified version of the dot-probe.' *Pain*, 142(1) pp. 42-47.

King, R. and Robinson, V. (2014) 'A Nine Week Pain Management Programme Improves Outcomes for Patients with Chronic Pain When Delivered as Part of a Pain Management Service: A Service Evaluation.' *Pain and Rehabilitation-the Journal of Physiotherapy Pain Association*, 2014(36) pp. 18-24.

Knaster, P., Karlsson, H., Estlander, A. M. and Kalso, E. (2012) 'Psychiatric disorders as assessed with SCID in chronic pain patients: the anxiety disorders precede the onset of pain.' *General Hospital Psychiatry*, 34(1) pp. 46-52.

Ko, S. M. and Zhou, M. (2004) 'Central plasticity and persistent pain.' *Drug Discovery Today: Disease Models*, 1(2) pp. 101-106.

Kobak, R. (1999) 'The emotional dynamics of disruptions in attachment relationships: Implications for theory, research, and clinical intervention.' *In* Cassidy, J. and Shaver, P. R. (eds.) *Handbook of attachment: Theory, research and clinical applications.* New Your, US: Guildford Press, pp. 21-43.

Koes, B., Van Tulder, M. and Thomas, S. (2006) 'Diagnosis and treatment of low back pain.' *British Medical Journal*, 332(7555) pp. 1430-1434.

Koster, E. H., Baert, S., Bockstaele, M. and De Raedt, R. (2010) 'Attentional retraining procedures: Manipulating early or late components of attentional bias?' *Emotion*, 10(2) pp. 230-236.

Koster, E. H., Crombez, G., Verschuere, B., Van Damme, S. and Wiersema, J. R. (2006) 'Components of attentional bias to threat in high trait anxiety: Facilitated engagement, impaired disengagement, and attentional avoidance.' *Behaviour Research and Therapy*, 44(12) pp. 1757-1771.

Kovacs, F., Noguera, J., Abraira, V., Royuela, A., Cano, A., del Real, M. T. G., Zamora, J., Gestoso, M., Muriel, A. and Mufraggi, N. (2008) 'The influence of psychological factors on low back pain-related disability in community dwelling older persons.' *Pain Medicine*, 9 pp. 871-880.

Kreitler, S., Chaitchik, S. and Kreitlers, H. (1993) 'Repressiveness: Cause or result of cancer?' *Psycho-Oncology*, 2(1) pp. 43-54.

Kroenke, K., Outcalt, S., Krebs, E., Bair, M. J., Wu, J., Chumbler, N. and Yu, Z. (2013) 'Association between anxiety, health-related quality of life and functional impairment in primary care patients with chronic pain.' *General Hospital Psychiatry*, 35 pp. 359-365.

Kugler, K., Wijn, J., Geilen, M., de Jong, J. and Vlaeyen, J. (1999) 'The Photograph series of Daily Activities (PHODA). CD-rom version 1.0. Institute for rehabilitation research and school for physiotherapy.'

Lang, P. J., Bradley, M. M. and Cuthbert, B. N. (2008) 'International affective picture system (IAPS): Affective ratings of pictures and instruction manual.' *Technical report A-8, University of Florida, Gainesville, FL*,

Lautenbacher, S., Huber, C., Kunz, M., Parthum, A., Weber, P. G., Griessinger, N. and Sittl, R. (2009) 'Hypervigilance as predictor of postoperative acute pain: its predictive potency compared with experimental pain sensitivity, cortisol reactivity, and affective state.' *The Clinical Journal of Pain*, 25(2) pp. 92-100.

Lazarus, R. and Folkman, S. (1984) *Stress, appraisal, and coping.* New York, USA: Springer Publishing Company LLC.

Leeuw, M., Goossens, M. E. J. B., van Breukelen, G. J. P., Boersma, K. and Vlaeyen, J. W. S. (2007) 'Measuring perceived harmfulness of physical activities in patients with chronic low back pain: the Photograph Series of Daily Activities—short electronic version.' *The Journal of Pain*, 8(11) pp. 840-849.

Leeuw, M., Houben, R., Severeijns, R., Picavet, H. S. J., Schouten, E. G. W. and Vlaeyen, J. W. S. (2007) 'Pain-related fear in low back pain: a prospective study in the general population.' *European Journal of Pain*, 11(3) pp. 256-266.

Leeuw, M., Goossens, M. E., Linton, S. J., Crombez, G., Boersma, K. and Vlaeyen, J. W. (2007) 'The fear-avoidance model of musculoskeletal pain: current state of scientific evidence.' *Journal of Behavioral Medicine*, 31(1) pp. 77-94.

Leonhardt, C., Lehr, D., Chenot, J. F., Keller, S., Luckmann, J., Basler, H. D., Baum, E., Donner-Banzhoff, N., Pfingsten, M., Hildebrandt, J., Kochen, M. M. and Becker, A. (2009) 'Are fear-avoidance beliefs in low back pain patients a risk factor for low physical activity or vice versa?' *Psychosocial Medicine*, 6 pp. 1-12.

Letham, J., Slade, P. D., Troup, J. D. G. and Bentley, G. (1983) 'Outline of a fear-avoidance model of exaggerated pain perception-1.' *Behaviour Research and Therapy*, 21(4) pp. 401-408.

Levy, R. L., Langer, S. L., Romano, J. M., Labus, J., Walker, L. S., Murphy, T. B., Van Tilburg, M., Feld, L. D., Christie, D. L. and Whitehead, W. E. (2014) 'Cognitive Mediators of Treatment Outcomes in Pediatric Functional Abdominal Pain.' *The Clinical Journal of Pain*, 30(12) pp. 1033-1043.

Lewis, S., Fowler, N., Woby, S. and Holmes, P. (2012) 'Defensive coping styles, anxiety and chronic low back pain.' *Physiotherapy*, 98(1) pp. 86-88.

Lewis, S., Holmes, P., Woby, S., Hindle, J. and Fowler, N. (2012) 'The relationships between measures of stature recovery, muscle activity and psychological factors in patients with chronic low back pain.' *Manual Therapy*, 17(1) pp. 27-33.

Liebert, R. M. and Morris, L. W. (1967) 'Cognitive and emotional components of test anxiety: A distinction and some initial data.' *Psychological Reports*, 20(3) pp. 975-978.

Linton, S. J. (2000) 'A review of psychological risk factors in back and neck pain.' *Spine*, 25(9) pp. 1148-1156.

Linton, S. J. (2001) 'Occupational psychological factors increase the risk for back pain: A systematic review.' *Journal of Occupational Rehabilitation*, 11(1) pp. 53-66.

Linton, S. J. (2005) 'Do psychological factors increase the risk for back pain in the general population in both a cross-sectional and prospective analysis?' *European Journal of Pain*, 9(4) pp. 355-361.

Linton, S. J. and Shaw, W. S. (2011) 'Impact of psychological factors in the experience of pain.' *Physical Therapy*, 91(5) pp. 700-711.

Liossi, C., Schoth, D. E., Bradley, B. P. and Mogg, K. (2009) 'Time-course of attentional bias for pain-related cues in chronic daily headache sufferers.' *European Journal of Pain*, 13(9) pp. 963-969.

Livingston, W. K. (1943) *Pain Mechanisms.* New York: Macmillan.

Loney, B. R., Kline, J. P., Joiner, T. E., Frick, P. J. and LaRowe, S. D. (2005) 'Emotional Word Detection and Adolescent Repressive–Defensive Coping Style.' *Journal of Psychopathology and Behavioral Assessment*, 27(1) pp. 1-9.

MacLeod, C. and Mathews, A. (1988) 'Anxiety and the allocation of attention to threat.' *The Quarterly Journal of Experimental Psychology*, 40(4) pp. 653-670.

MacLeod, C., Mathews, A. and Tata, P. (1986) 'Attentional bias in emotional disorders.' *Journal of Abnormal Psychology*, 95(1) pp. 15-20.

Magni, G., Marchetti, M., Moreschi, C., Merskey, H. and Luchini, S. R. (1993) 'Chronic musculoskeletal pain and depressive symptoms in the National Health and Nutrition Examination I. Epidemiologic follow-up study.' *Pain*, 53(2) pp. 163-168.

Main, C. J. and Watson, P. J. (1996) 'Guarded movements: development of chronicity.' *Journal of Musculoskelatal Pain*, 4(4) pp. 163-170.

Main, C. J. and Spanswick, C. S. (2000) 'Models of pain.' *In* Main, C. J. and Spanswick, C. S. (eds.) *Pain Management: An Interdisciplinary Approach*. London: Churchill Livingstone, pp. 3-18.

Main, C. J., Sowden, G., Hill, J. C., Watson, P. J. and Hay, E. M. (2012) 'Integrating physical and psychological approaches to treatment in low back pain: the development and content of the STarT Back trial's 'high-risk'intervention (StarT Back; ISRCTN 37113406).' *Physiotherapy*, 98(2) pp. 110-116.

Maniadakis, N. and Gray, A. (2000) 'The economic burden of back pain in the UK.' *Pain*, 84(1) pp. 95-103.

Mannion, A. F., Müntener, M., Taimela, S. and Dvorak, J. (2001) 'Comparison of three active therapies for chronic low back pain: results of a randomized clinical trial with one-year follow-up.' *Rheumatology*, 40(7) pp. 772-778.

Mäntyselkä, P. T., Kumpusalo, E. A., Ahonen, R. S. and Takala, J. K. (2002) 'Direct and indirect costs of managing patients with musculoskeletal pain—challenge for health care.' *European Journal of Pain*, 6(2) pp. 141-148.

Marks, D. F. and Yardley, L. (2004) *Research Methods for Clinical and Health Psychology.* Padstow: Sage Publications.

Martens, R., Burton, D., Vealey, R. S., Bump, L. A. and Smith, D. E. (1990) *Development and validation of the competitive state anxiety inventory-2. .* Champaign, IL: Human Kinetics.

May, S. J. (2001) 'Patient satisfaction with management of back pain. Part 1: what is satisfaction? Review of satisfaction with medical management. Part 2: An explorative, qualitative study into patients' satisfaction with physiotherapy.' *Physiotherapy*, 87(1) pp. 4-20.

McCaffery, M. and Pasero, C. (1999) *Pain: A Clinical Manual.* St Louis: Mosby.

McCluskey, S., Brooks, J., King, N. and Burton, K. (2011) 'The influence of'significant others' on persistent back pain and work participation: a qualitative exploration of illness perceptions.' *BMC Musculoskeletal Disorders*, 12(1) p. 236.

McCracken, L. M. (1997) '"Attention" to pain in persons with chronic pain: A behavioural approach.' *Behaviour Therapy*, 28 pp. 271-284.

McCracken, L. M. and Turk, D. C. (2002) 'Behavioral and cognitive–behavioral treatment for chronic pain: outcome, predictors of outcome, and treatment process.' *Spine*, 27(22) pp. 2564-2573.

McCracken, L. M., Evon, D. and Darapas, E. T. (2002) 'Satisfaction with treatment for chronic pain in a speciality service: preliminary prospective results.' *European Journal of Pain*, 6(5) pp. 387-393.

McCracken, L. M., Gross, R. T., Sorg, P. and Edmands, T. A. (1993) 'Prediction of pain in patients with chronic low back pain: effects of inaccurate

prediction and pain-related anxiety.' *Behaviour Research and Therapy*, 31(7) pp. 647-652.

McCrae, R. R. and Costa Jr, P. T. (1985) 'Comparison of EPI and psychoticism scales with measures of the five-factor model of personality.' *Personality and Individual Differences*, 6(5) pp. 587-597.

McInnis, O. A., Matheson, K. and Anisman, H. (2014) 'Living with the unexplained: coping, distress, and depression among women with chronic fatigue syndrome and/or fibromyalgia compared to an autoimmune disorder.' *Anxiety, Stress & Coping*, 27(6) pp. 1-18.

Melzack, R. and Wall, P. D. (1965) 'Pain mechanisms: a new theory.' *Science*, 150 pp. 971-979.

Melzack, R. and Casey, K. L. (1968) 'Sensory, motivational and central control determinants of pain.' *In* Kenshalo, D. R. (ed.) *The Skin Senses*. Springfield: Charles C Thomas, pp. 423-439.

Melzack, R., Wall, P. D. and Ty, T. C. (1982) 'Acute pain in an emergency clinic: latency of onset and descriptor patterns related to different injuries.' *Pain*, 14(1) pp. 33-43.

Merskey, H., Albe-Fessard, D. and Bonica, J. (1979) 'International Association for the Study of Pain. Pain terms: a list with definitions and notes on usage.' *Pain*, 6 pp. 249-252.

Miller, C. A. (2009) *Nursing for Wellness in Older Adults.* China: Lippincott Williams & Wilkins.

Miller, R., Kori, S. and Todd, D. (1991) 'The tampa scale.' *Unpublished Report, Tampa, FL*,

Miro, E., Martinez, M. P., Sanchez, A. I., Prados, G. and Medina, A. (2011) 'When is pain related to emotional distress and daily functioning in fibromyalgia syndrome? The mediating roles of self-efficacy and sleep quality.' *British Journal of Health Psychology*, 16 pp. 799-814.

Mogg, K. and Bradley, B. P. (1998) 'A cognitive-motivational analysis of anxiety.' *Behaviour Research and Therapy*, 36(9) pp. 809-848.

Mogg, K. and Bradley, B. P. (1999) 'Some methodological issues in assessing attentional biases for threatening faces in anxiety: A replication study using a modified version of the probe detection task.' *Behaviour Research and Therapy*, 37(6) pp. 595-604.

Mogg, K. and Bradley, B. P. (2005) 'Attentional bias in generalized anxiety disorder versus depressive disorder.' *Cognitive Therapy and Research*, 29(1) pp. 29-45.

Mogg, K., Bradley, B. P., Dixon, C., Fisher, S., Twelftree, H. and McWilliams, A. (2000) 'Trait anxiety, defensiveness and selective processing of threat: An investigation using two measures of attentional bias.' *Personality and Individual Differences*, 28(6) pp. 1063-1077.

Morley, S., Eccleston, C. and Williams, A. (1999) 'Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache.' *Pain*, 80(1) pp. 1-13.

Morris, L. W., Davis, M. A. and Hutchings, C. H. (1981) 'Cognitive and emotional components of anxiety: Literature review and a revised worry–emotionality scale.' *Journal of Educational Psychology*, 73(4) p. 541.

Mund, M. and Mitte, K. (2012) 'The costs of repression: A meta-analysis on the relation between repressive coping and somatic diseases.' *Health Psychology*, 31(5) p. 640.

Myers, L. B. (1998) 'Repressive coping, trait anxiety and reported avoidance of negative thoughts.' *Personality and Individual Differences*, 24(3) pp. 299-303.

Myers, L. B. (2010) 'The importance of the repressive coping style: findings from 30 years of research.' *Anxiety, Stress & Coping*, 23(1) pp. 3-17.

Myers, L. B. and Vetere, A. (1997) 'Repressors' responses to health-related questionnaires.' *British Journal of Health Psychology*, 2(3) pp. 245-257.

Myers, L. B., Davis, A., Evans, E. and Stygall, J. (2005) 'How successful are repressors at self-care behviour?' *Psychology and Health*, 20 pp. 188-189.

National Institute for Health and Clinical Excellence (NICE). (2009) *Low back pain: early management of persistent non-specific low back pain.*: [Online] [Accessed on 20th August] http://guidance.nice.org.uk/CG88

O'Sullivan, K., O'Sullivan, P., O'Sullivan, L. and Dankaerts, W. (2013) 'Back pain beliefs among physiotherapists are more positive after biopsychosocially orientated workshops.' *Physiotherapy Practice and Research*, 34(1) pp. 37-45.

Orton, M., Fitzpatrick, R., Fuller, A., Mant, D., Mlynek, C. and Thorogood, M. (1991) 'Factors affecting women's response to an invitation to attend for a second breast cancer screening examination.' *The British Journal of General Practice*, 41(349) p. 320.

Ostelo, R., Stomp-van den Berg, S., Vlaeyen, J., Wolters, P. and De Vet, H. (2003) 'Health care provider's attitudes and beliefs towards chronic low back pain: the development of a questionnaire.' *Manual Therapy*, 8(4) pp. 214-222.

Ostelo, R. W. and de Vet, H. C. (2005) 'Clinically important outcomes in low back pain.' *Best Practice & Research Clinical Rheumatology*, 19(4) pp. 593-607.

Perry, E. V. and Francis, A. J. (2012) 'Self-Efficacy, Pain-Related Fear, and Disability in a Heterogeneous Pain Sample.' *Pain Management Nursing*, 14(4) pp. 124-134.

Phillips, C. (2009) 'The cost and burden of chronic pain.' *British Journal of Pain*, 3 pp. 12-15.

Phipps, S. and Steele, R. (2002) 'Repressive adaptive style in children with chronic illness.' *Psychosomatic Medicine*, 64(1) pp. 34-42.

Picavet, H. S. J., Vlaeyen, J. W. and Schouten, J. S. (2002) 'Pain catastrophizing and kinesiophobia: predictors of chronic low back pain.' *American Journal of Epidemiology*, 156(11) pp. 1028-1034.

Pincus, T. and Morley, S. (2001) 'Cognitive-processing bias in chronic pain: a review and integration.' *Psychological Bulletin*, 127(5) pp. 599-617.

Pincus, T., Fraser, L. and Pearce, S. (1998) 'Do chronic pain patients' Stroop'on pain stimuli?' *British Journal of Clinical Psychology*, 37(1) pp. 49-58.

Pincus, T., Burton, A. K., Vogel, S. and Field, A. P. (2002) 'A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain.' *Spine*, 27(5) pp. E109-E120.

Pincus, T., Smeets, R. J. E. M., Simmonds, M. J. and Sullivan, M. J. L. (2010) 'The fear avoidance model disentangled: improving clinical utility of the fear avoidance model.' *The Clinical Journal of Pain*, 26(9) pp. 739-746.

Pincus, T., Vogel, S., Burton, A. K., Santos, R. and Field, A. P. (2006) 'Fear avoidance and prognosis in back pain. A systematic review and synthesis of current evidence.' *Arthritis & Rheumatism*, 54(12) pp. 3999-4010.

Pincus, T., Kent, P., Bronfort, G., Loisel, P., Pransky, G. and Hartvigsen, J. (2013) 'Twenty-Five Years With the Biopsychosocial Model of Low Back Pain—Is It Time to Celebrate? A Report From the Twelfth International Forum for Primary Care Research on Low Back Pain.' *Spine*, 38(24) pp. 2118-2123.

Pope, C. and Mays, N. (2006) *Qualitative Research in Health Care.* 3rd ed.: Blackwell Publishing.

Posner, M. I., Nissen, M. J. and Ogden, W. C. (1978) 'Attended and unattended processing modes: The role of set for spatial location.' *In* Pick, J., H. L. and Saltzman, E. (eds.) *Modes of perceiving and processing information*. East Sussex, UK: Psychology Press, pp. 137-157.

Prasertsri, N., Holden, J., Keefe, F. J. and Wilkie, D. J. (2011) 'Repressive coping style: Relationships with depression, pain, and pain coping strategies in lung cancer out patients.' *Lung Cancer*, 71(2) pp. 235-240.

Radloff, L. S. (1977) 'The CES-D Scale: A self-report depression scale for research in the general population.' *Applied Psychological Measurement*, 1(3) pp. 385-401.

Radojevic, V., Nicassio, P. M. and Weisman, M. H. (1993) 'Behavioral intervention with and without family support for rheumatoid arthritis.' *Behavior Therapy*, 23(1) pp. 13-30.

Rasmussen-Barr, E., Campello, M., Arvidsson, I., Nilsson-Wikmar, L. and Äng, B.-O. (2012) 'Factors predicting clinical outcome 12 and 36 months after an exercise intervention for recurrent low-back pain.' *Disability and Rehabilitation*, 34(2) pp. 136-144.

Reynolds, W. M. (1982) 'Development of reliable and valid short forms of the marlowe? crowne social desirability scale.' *Journal of Clinical Psychology*, 38(1) pp. 119-125.

Roelofs, J., Peters, M. L., Zeegers, M. and Vlaeyen, J. W. S. (2002) 'The modified Stroop paradigm as a measure of selective attention towards pain-related stimuli among chronic pain patients: a meta-analysis.' *European Journal of Pain*, 6(4) pp. 273-281.

Roelofs, J., Peters, M. L., Fassaert, T. and Vlaeyen, J. W. (2005) 'The role of fear of movement and injury in selective attentional processing in patients with chronic low back pain: a dot-probe evaluation.' *The Journal of Pain*, 6(5) pp. 294-300.

Rohner, J.-C. (2002) 'The time-course of visual threat processing: High trait anxious individuals eventually avert their gaze from angry faces.' *Cognition and Emotion*, 16(6) pp. 837-844.

Roland, M. and Morris, R. (1983) 'A study of the natural history of back pain: part I: development of a reliable and sensitive measure of disability in low-back pain.' *Spine*, 8(2) pp. 141-144.

Roland, M. and Fairbank, J. (2000) 'The Roland–Morris disability questionnaire and the Oswestry disability questionnaire.' *Spine*, 25(24) pp. 3115-3124.

Romano, J. M., Jensen, M. P., Turner, J. A., Good, A. B. and Hops, H. (2000) 'Chronic pain patient-partner interactions: Further support for a behavioral model of chronic pain.' *Behavior Therapy*, 31(3) pp. 415-440.

Salaffi, F., Stancati, A., Silvestri, C. A., Ciapetti, A. and Grassi, W. (2004) 'Minimal clinically important changes in chronic musculoskeletal pain intensity

measured on a numerical rating scale.' *European Journal of Pain*, 8(4) pp. 283-291.

Sanderson, K. B., Roditi, D., George, S. Z., Atchison, J. W., Banou, E. and Robinson, M. E. (2012) 'Investigating patient expectations and treatment outcome in a chronic low back pain population.' *Journal of Pain Research*, 5 pp. 15-22.

Savigny, P., Watson, P. and Underwood, M. (2009) 'Early management of persistent non-specific low back pain: summary of NICE guidance.' *British Medical Journal*, 338(b) p. 1805.

Schoth, D. E. and Liossi, C. (2010) 'Attentional bias toward pictorial representations of pain in individuals with chronic headache.' *The Clinical Journal of Pain*, 26(3) pp. 244-250.

Schoth, D. E., Nunes, V. D. and Liossi, C. (2012) 'Attentional bias towards pain-related information in chronic pain; a meta-analysis of visual-probe investigations.' *Clinical Psychology Review*, 32(1) pp. 13-25.

Schoth, D. E., Georgallis, T. and Liossi, C. (2013) 'Attentional bias modification in people with chronic pain: a proof of concept study.' *Cognitive Behaviour Therapy*, 42(3) pp. 233-243.

Severeijns, R., Vlaeyen, J. W. and van den Hout, M. A. (2004) 'Do we need a communal coping model of pain catastrophizing? An alternative explanation.' *Pain*, 111(3) pp. 226-229.

Severeijns, R., van den Hout, M. A., Vlaeyen, J. W. and Picavet, H. S. J. (2002) 'Pain catastrophizing and general health status in a large Dutch community sample.' *Pain*, 99(1) pp. 367-376.

Sharpe, L., Ianiello, M., Dear, B. F., Perry, K. N., Refshauge, K. and Nicholas, M. K. (2012) 'Is there a potential role for attention bias modification in pain patients? Results of 2 randomised, controlled trials.' *Pain*, 153(3) pp. 722-731.

Sieben, J. M., Vlaeyen, J. W., Portegijs, P. J., Verbunt, J. A., van Riet-Rutgers, S., Kester, A. D., Von Korff, M., Arntz, A. and Andre Knottnerus, J. (2005) 'A longitudinal study on the predictive validity of the fear–avoidance model in low back pain.' *Pain*, 117(1) pp. 162-170.

Skinner, M., Wilson, H. D. and Turk, D. C. (2012) 'Cognitive-Behavioral Perspective and Cognitive-Behavioral Therapy for People With Chronic Pain: Distinctions, Outcomes, and Innovations.' *Journal of Cognitive Psychotherapy*, 26(2) pp. 93-113.

Smeets, R. J., Vlaeyen, J. W., Kester, A. D. and Knottnerus, J. A. (2006) 'Reduction of pain catastrophizing mediates the outcome of both physical and cognitive-behavioral treatment in chronic low back pain.' *The Journal of Pain*, 7(4) pp. 261-271.

Snider, B. S., Asmundson, G. J. and Wiese, K. C. (2000) 'Automatic and strategic processing of threat cues in patients with chronic pain: A modified Stroop evaluation.' *The Clinical Journal of Pain*, 16(2) pp. 144-154.

Spielberger, C. D., Gorssuch, R. L., Lushene, P. R., Vagg, P. R. and Jacobs, G. A. (1983) *Manual for the State-Trait Anxiety Inventory.* Mountain View: Consulting Psychologists Press.

Spinhoven, P., Kuile, M., Kole-Snijders, A. M., Mansfeld, M. H., Ouden, D. J. and Vlaeyen, J. W. (2004) 'Catastrophizing and internal pain control as mediators of outcome in the multidisciplinary treatment of chronic low back pain.' *European Journal of Pain*, 8(3) pp. 211-219.

Stenberg, G., Fjellman-Wiklund, A. and Ahlgren, C. (2013) "I am afraid to make the damage worse'–fear of engaging in physical activity among patients with neck or back pain–a gender perspective.' *Scandinavian Journal of Caring Sciences*, 28(1) pp. 146-154.

Stephens, B. and Gross, D. P. (2007) 'The influence of a continuum of care model on the rehabilitation of compensation claimants with soft tissue disorders.' *Spine*, 32(25) pp. 2898-2904.

Strahan, R. and Gerbasi, K. C. (1972) 'Short, homogeneous versions of the Marlowe-Crowne Social Desirability Scale.' *Journal of Clinical Psychology*, 28 pp. 191-193.

Stroop, J. R. (1935) 'Studies of interference in serial verbal reactions.' *Journal of Experimental Psychology*, 18(6) p. 643.

Strunin, L. and Boden, L. I. (2004) 'Family consequences of chronic back pain.' *Social Science & Medicine*, 58(7) pp. 1385-1393.

Sullivan, M. J., Rouse, D., Bishop, S. and Johnston, S. (1997) 'Thought suppression, catastrophizing, and pain.' *Cognitive Therapy and Research*, 21(5) pp. 555-568.

Sullivan, M. J., Thorn, B., Haythornthwaite, J. A., Keefe, F., Martin, M., Bradley, L. A. and Lefebvre, J. C. (2001) 'Theoretical perspectives on the relation between catastrophizing and pain.' *The Clinical Journal of Pain*, 17(1) pp. 52-64.

Sullivan, M. J. L., Bishop, S. R. and Pivik, J. (1995) 'The pain catastrophizing scale: development and validation.' *Psychological Assessment*, 7(4) pp. 524-532.

Thompson, D. P., Urmston, M., Oldham, J. A. and Woby, S. R. (2010) 'The association between cognitive factors, pain and disability in patients with idiopathic chronic neck pain.' *Disability & Rehabilitation*, 32(21) pp. 1758-1767.

Thomsen, A. B., Sørensen, J., Sjøgren, P. and Eriksen, J. (2002) 'Chronic non-malignant pain patients and health economic consequences.' *European Journal of Pain*, 6(5) pp. 341-352.

Thomson, D. (2000) 'Problem patients as experienced by senior therapists in the context of their working lives.' *Advances in Physiotherapy*, 21(1) pp. 2-13.

Toye, F. and Barker, K. (2010) ''Could I be imagining this?'–the dialectic struggles of people with persistent unexplained back pain.' *Disability and Rehabilitation*, 32(21) pp. 1722-1732.

Trentman, T. L., Cornidez, E. G., Wilshusen, L. L., Chang, Y. H. H., Seamans, D. P., Rosenfeld, D. M., Freeman, J. A. and Chien, J. J. (2012) 'Patient Satisfaction in an Academic Chronic Pain Clinic.' *Pain Practice*, 13(5) pp. 372-379.

Trost, Z., France, C. R. and Thomas, J. S. (2009) 'Examination of the photograph series of daily activities (PHODA) scale in chronic low back pain patients with high and low kinesiophobia.' *Pain*, 141(3) pp. 276-282.

Truchon, M. (2001) 'Determinants of chronic disability related to low back pain: towards an integrative biopsychosocial model.' *Disability & Rehabilitation*, 23(17) pp. 758-767.

Turk, D. C. and Gatchel, R. J. (1999) 'Psychosocial factors and pain: a revolution and evolution.' *In* Gatchel, R. J. and Turk, D. C. (eds.) *Psychosocial Factors in Pain Critical Perspectives*. New York: Guildford Press, pp. 481-493.

Turk, D. C. and Okifuji, A. (2002) 'Psychological factors in chronic pain: evolution and revolution.' *Journal of Consulting and Clinical Psychology*, 70(3) p. 678.

Turk, D. C. and Burwinkle, T. (2007) 'Pain: a Multidimensional Perspective.' *In* Ayers, S., Baum, A., McManus, C., Newman, S., Wallston, K., Weinman, J. and West, R. (eds.) *Cambridge Handbook of Psychology, Health, & Medicine*. 2 ed., New York: Cambridge University Press, pp. 141-147.

Turk, D. C., Meichenbaum, D. and Genest, M. (1983) *Pain and Behavioural Medicine. A cognitive Behaviour Perspective.* United States of America: Guildford Press.

Turk, D. C., Dworkin, R. H., Revicki, D., Harding, G., Burke, L. B., Cella, D., Cleeland, C. S., Cowan, P., Farrar, J. T. and Hertz, S. (2008) 'Identifying important outcome domains for chronic pain clinical trials: an IMMPACT survey of people with pain.' *Pain*, 137(2) pp. 276-285.

Turner, J. A., Ersek, M. and Kemp, C. (2005) 'Self-efficacy for managing pain is associated with disability, depression, and pain coping among retirement community residents with chronic pain.' *The Journal of Pain*, 6(7) pp. 471-479.

Turner, J. A., Brister, H., Huggins, K., Mancl, L., Aaron, L. A. and Truelove, E. L. (2005) 'Catastrophizing is associated with clinical examination findings, activity interference, and health care use among patients with temporomandibular disorders.' *Journal of Orofacial Pain*, 19(4) pp. 291-300.

Ung, H., Brown, J. E., Johnson, K. A., Younger, J., Hush, J. and Mackey, S. (2012) 'Multivariate classification of structural MRI data detects chronic low back pain.' *Cerebral Cortex*,

Van Damme, S., Crombez, G. and Eccleston, C. (2004) 'Disengagement from pain: the role of catastrophic thinking about pain.' *Pain*, 107(1) pp. 70-76.

Van Damme, S., Crombez, G., Eccleston, C. and Koster, E. H. (2006) 'Hypervigilance to learned pain signals: a componential analysis.' *The Journal of Pain*, 7(5) pp. 346-357.

Van Damme, S., Legrain, V., Vogt, J. and Crombez, G. (2010) 'Keeping pain in mind: a motivational account of attention to pain.' *Neuroscience & Biobehavioral Reviews*, 34(2) pp. 204-213.

van Tulder, M. W., Ostelo, R., Vlaeyen, J. W., Linton, S. J., Morley, S. J. and Assendelft, W. J. (2001) 'Behavioral treatment for chronic low back pain: a systematic review within the framework of the Cochrane Back Review Group.' *Spine*, 26(3) pp. 270-281.

Vancleef, L. M. and Peters, M. L. (2006) 'Pain catastrophizing, but not injury/illness sensitivity or anxiety sensitivity, enhances attentional interference by pain.' *The Journal of Pain*, 7(1) pp. 23-30.

Vase, L., Egsgaard, L. L., Nikolajsen, L., Svensson, P., Jensen, T. S. and Arendt-Nielsen, L. (2012) 'Pain catastrophizing and cortical responses in amputees with varying levels of phantom limb pain: a high-density EEG brain-mapping study.' *Experimental Brain Research*, 218 pp. 407-417.

Verbeek, J., Sengers, M. J., Riemens, L. and Haafkens, J. (2004) 'Patient expectations of treatment for back pain: a systematic review of qualitative and quantitative studies.' *Spine*, 29(20) pp. 2309-2318.

Verbunt, J. A., Seelen, H. A., Vlaeyen, J. W., Bousema, E. J., van der Heijden, G. J., Heuts, P. H. and Knottnerus, J. A. (2005) 'Pain-related factors contributing to muscle inhibition in patients with chronic low back pain: an experimental investigation based on superimposed electrical stimulation.' *The Clinical Journal of Pain*, 21(3) pp. 232-240.

Vlaeyen, J. W. and Linton, S. J. (2000) 'Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art.' *Pain*, 85(3) pp. 317-332.

Vlaeyen, J. W. and Morley, S. (2005) 'Cognitive-behavioral treatments for chronic pain: what works for whom?' *The Clinical Journal of Pain*, 21(1) pp. 1-8.

Vlaeyen, J. W., Kole-Snijders, A. M. J., Boeren, R. G. B. and Van Eek, H. (1995) 'Fear of movement/(re) injury in chronic low back pain and its relation to behavioral performance.' *Pain*, 62(3) pp. 363-372.

Vlaeyen, J. W., de Jong, J., Geilen, M., Heuts, P. H. T. G. and van Breukelen, G. (2001) 'Graded exposure in vivo in the treatment of pain-related fear: a replicated single-case experimental design in four patients with chronic low back pain.' *Behaviour Research and Therapy*, 39(2) pp. 151-166.

Vlaeyen, J. W., de Jong, J., Geilen, M., Heuts, P. H. T. G. and van Breukelen, G. (2002) 'The treatment of fear of movement/(re) injury in chronic low back pain: further evidence on the effectiveness of exposure in vivo.' *The Clinical Journal of Pain*, 18(4) pp. 251-261.

Von Korff, M., Jensen, M. P. and Karoly, P. (2000) 'Assessing global pain severity by self-report in clinical and health services research.' *Spine*, 25(24) pp. 3140-3151.

Von Korff, M., Shortreed, S. M., Saunders, K. W., LeResche, L., Berlin, J. A., Stang, P. and Turner, J. A. (2014) 'Comparison of back pain prognostic risk stratification item sets.' *The Journal of Pain*, 15(1) pp. 81-89.

Waddell, G. (1987) 'A new clinical model for the treatment of low back pain.' *Spine*, 12 pp. 632-644.

Waddell, G., Somerville, D., Henderson, I. and Newton, M. (1992) 'Objective clinical evaluation of physical impairment in chronic low back pain.' *Spine*, 17(6) pp. 617-628.

Waechter, S., Nelson, A. L., Wright, C., Hyatt, A. and Oakman, J. (2014) 'Measuring attentional bias to threat: Reliability of dot probe and eye movement indices.' *Cognitive Therapy and Research*, 38(3) pp. 313-333.

Wall, P. D. (1979) 'On the realtionship of injury to pain.' *Pain*, 6 pp. 253-264.

Watson, D. and Clark, L. A. (1984) 'Negative affectivity: the disposition to experience aversive emotional states.' *Psychological Bulletin*, 96(3) pp. 465-490.

Weddell, G. (1955) 'Somesthesis and the chemical senses.' *Anual Review of Psychology*, 6 pp. 119-136.

Weinberger, D. A. (1990) *The construct validity of the repressive coping style.* Chicago, IL: University of Chicago Press.

Weinberger, D. A., Schwartz, G. E. and Davidson, R. J. (1979) 'Low-anxious, high-anxious, and repressive coping styles: psychometric patterns and behavioral and physiological responses to stress.' *Journal of Abnormal Psychology*, 88(4) p. 369.

Wells, G., Beaton, D., Shea, B., Boers, M., Simon, L., Strand, V., Brooks, P. and Tugwell, P. (2001) 'Minimal clinically important differences: review of methods.' *The Journal of Rheumatology*, 28(2) pp. 406-412.

Wensing, M., Grol, R. and Smits, A. (1994) 'Quality judgements by patients on general practice care: a literature analysis.' *Social Science Medicine*, 38 pp. 45-53.

Wertli, M. M., Burgstaller, J. M., Weiser, S., Steurer, J., Kofmehl, R. and Held, U. (2014) 'Influence of Catastrophizing on Treatment Outcome in Patients With Nonspecific Low Back Pain: A Systematic Review.' *Spine*, 39(3) pp. 263-273.

Wetherell, J. L., Afari, N., Rutledge, T., Sorrell, J. T., Stoddard, J. A., Petkus, A. J., Solomon, B. C., Lehman, D. H., Liu, L. and Lang, A. J. (2011) 'A randomized, controlled trial of acceptance and commitment therapy and cognitive-behavioral therapy for chronic pain.' *Pain*, 152(9) pp. 2098-2107.

Williams, A., Eccleston, C. and Morley, S. (2012) 'Psychological therapies for the management of chronic pain (excluding headache) in adults.' *Cochrane Database Syst Rev*, 11 pp. 1-111.

Williams, J. M. G., Watts, F. N., MacLeod, C. and Mathews, A. (1988) *Cognitive psychology and emotional disorders.* Chichester: John Wiley & Sons.

Williams, J. M. G., Watts, F. N., MacLeod, C. and Mathews, A. (1997) *Cognitive psychology and emotional disorders.* 2nd ed., Chichester: John Wiley & Sons.

Woby, S. R., Urmston, M. and Watson, P. J. (2007) 'Self-Efficacy mediates the relation between pain-related fear and outcome in chronic low back pain patients.' *European Journal of Pain*, 11(7) pp. 711-718.

Woby, S. R., Watson, P. J., Roach, N. K. and Urmston, M. (2004a) 'Are changes in fear-avoidance beliefs, catastrophizing, and appraisals of control, predictive of changes in chronic low back pain and disability?' *European Journal of Pain*, 8(3) pp. 201-210.

Woby, S. R., Watson, P. J., Roach, N. K. and Urmston, M. (2004b) 'Adjustment to chronic low back pain—the relative influence of fear-avoidance beliefs, catastrophizing, and appraisals of control.' *Behaviour Research and Therapy*, 42(7) pp. 761-774.

Woby, S. R., Roach, N. K., Urmston, M. and Watson, P. J. (2005) 'Psychometric properties of the TSK-11: a shortened version of the Tampa Scale for Kinesiophobia.' *Pain*, 117(1) pp. 137-144.

Woby, S. R., Roach, N. K., Urmston, M. and Watson, P. J. (2007) 'The relation between cognitive factors and levels of pain and disability in chronic low back

pain patients presenting for physiotherapy.' *European Journal of Pain*, 11(8) pp. 869-877.

Woby, S. R., Roach, N. K., Urmston, M. and Watson, P. J. (2008) 'Outcome Folowing a physiotherapist led intervention for chronic low back pain: the important role of cognitive processes.' *Physiotherapy*, 94(2) pp. 115-124.

Woo, A. K. M. (2010) 'Depression and anxiety in pain.' *Reviews in Pain*, 4 pp. 8-12.

Zachariae, R., Jensen, A. B., Pedersen, C., Jørgensen, M. M., Christensen, S., Lassesen, B. and Lehbrink, M. (2004) 'Repressive coping before and after diagnosis of breast cancer.' *Psycho-Oncology*, 13(8) pp. 547-561.

Zanini, C., Sarzi-Puttini, P., Atzeni, F., Di Franco, M. and Rubinelli, S. (2014) 'Doctors' Insights into the Patient Perspective: A Qualitative Study in the Field of Chronic Pain.' *BioMed research international*, 2014

APPENDICES

APPENDIX 1

PARTICIPANT INFORMATION PACK FOR STUDIES 1, 3 AND 4

Miss Zoë C Franklin,
Manchester Metropolitan University,
MMU Cheshire,
Crewe Green Road,
Crewe,
Cheshire,
CW1 5DU.

Dear Sir/Madam,

We would like to invite you to take part in a research study being conducted by Manchester Metropolitan University investigating some of the factors that may affect the way you respond to pain and its treatment. The study only requires you to complete a short questionnaire at four points the next year at a place convenient for you. We estimate each one will only take you 20 minutes to complete.

Within this envelope you will find an information sheet, providing you with more detail about the study. This study is very easy to complete and does not require you to attend any additional sessions nor will it affect the treatment you receive. After reading the information sheet, please sign the attached consent form and indicate the way you would like to receive the questionnaires (post or email). A pre-paid envelope is enclosed for your reply.

If you would like to ask further questions about the study then please contact Zoë Franklin at z.franklin@mmu.ac.uk or by phone 0161 247 5528.

Kind Regards,

Zoe Franklin

Zoë Franklin

MANCHESTER METROPOLITAN UNIVERSITY

Department of Exercise and Sport Science

Information Sheet for Participants

Title of Study:

The role of coping styles in the management of chronic pain.

Participant Information Sheet

1) This is an invitation to take part in a piece of research.

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Please take time to decide whether or not you wish to take part.

2) What is the purpose of the research?

The purpose of the study is to determine if the way people interpret and react to stresses (coping style) has an impact on the way they experience and respond to chronic pain and its treatment.

3) Why is the study being performed?

Earlier research suggests that there may be a link between the way people cope with stresses (their coping style) and the way they respond to pain and its treatment. This would mean that people who have some coping styles may tend to do better after treatment than others and also that different types of treatment may work better for certain people. It is hoped that, through this and other related studies, we will better understand whether coping styles are important in determining the most successful ways to manage chronic pain. Our research will involve people who are having treatment for chronic pain and also people who do not have any pain, so that we can compare the two groups.

4) Why am I being asked to take part?

We have asked you to take part in this study because you are either attending a chronic pain management programme or you are not suffering from any chronic pain condition and will form part of our control group.

5) Do I have to take part?

You are under no obligation to take part in this study. If, after reading this information sheet and asking any additional questions, you do not feel comfortable taking part in the study you do not have to. If you do decide to take part you are free to withdraw from the study at any point, without having to give a reason. If you do withdraw from the study you are free to take any personal data with you and this will not be included when the research is reported. If you decide not to take part or withdraw from the study it will not affect the medical care that you receive now or in the future.

If you do decide to take part you will be asked to sign an informed consent form stating your agreement to take part and you will be given a copy together with this information sheet to keep.

6) What will happen to me if I agree to take part?

If you agree to take part you will be asked to complete a number of questionnaires either on paper or electronically. These questionnaires will ask a series of questions about how you feel or respond to different situations, this will allow us to classify your coping style. We anticipate that it would take about 20 minutes to complete the questionnaires. All individual responses will be anonymous. Questionnaires will be administered on four occasions across a twelve month period.

A small sample of individuals will also be asked to participate in interviews across the study period. These interviews will explore similar issues to the questionnaires and give us a deeper insight into the participants' views. At the time of the interviews you will be written to and asked whether you would be willing participate. If you are willing, then a new consent form will be sent to you to complete. Interviews will take place either at your treating clinic or via telephone and will be recorded and transcribed for analysis purposes, a copy of the transcript will be sent to you and the original recording destroyed once transcription has been completed. No comments will be ascribed to individuals and outcomes treated anonymously.

7) Are there any disadvantages or risks in taking part?

There are no disadvantages to taking part in the study. The questionnaires are not intended to be intrusive to your personal life and you are free to miss out any questions that you do not wish to answer.

8) What are the possible benefits of taking part?

It is unlikely that you will benefit directly from taking part in this research as we are at an early stage of investigating the importance of coping styles in chronic pain. However, the study does aim to improve our understanding of the factors that influence pain management and may contribute to future improvements in this area.

9) Who are the members of the research team?

The Principal Investigator is Zoe Franklin. If you require further information then please do not hesitate to email on z.franklin@mmu.ac.uk

The research Supervisors are Dr. Sandra Lewis, Prof Neil Fowler and Dr. Nickolas Smith from the Department of Exercise and Sport Science at MMU Cheshire (s.lewis@mmu.ac.uk / n.fowler@mmu.ac.uk/ n.c.smith@mmu.ac.uk).

10) Who is funding the research?

The research has been funded by the Institute for Performance Research at Manchester Metropolitan University and is being undertaken as part of a postgraduate degree research project.

11) Who will have access to the data?

All of the information collected will be kept confidential and used only for the purposes of this study and any associated publications. The data will be stored in a coded format, participant names and codes will not be kept in the same location and the storage system will be password protected. Only the Principal Investigator and named members of the research team will have access to the data. The data will be kept for the duration of the study and for any necessary period associated with resulting publications.

If the results of the study are used in conferences or published in scientific journals at some point in the future, participants will not be identified in any way. As a participant you have the right to obtain a copy of any publication resulting from the research.

12) Who do I contact if I feel my rights have been violated?

If you feel that your rights have been violated then please contact the address provided below:

Registrar & Clerk to the Board of Governors
Head of Governance and Secretariat Team
Manchester Metropolitan University,
All Saints Building, All Saints,
Manchester, M15 6BH
Tel: 0161 247 1390.

I confirm that the insurance policies in place at Manchester Metropolitan University will cover claims for negligence arising from the conduct of the University's normal business, which includes research carried out by staff and by undergraduate and postgraduate students as part of their course. This does not extend to clinical negligence.

13) Finally, a thank you!

Thank you very much for considering participating in this study. I hope that the information I have provided is in enough detail for you. If you have any questions before you agree please do not hesitate to ask.

Department of Exercise and Sport Science

Manchester Metropolitan University

Informed Consent Form

Project Title: The role of coping styles in the management of chronic pain

Chief Investigator: Zoë Franklin

Name:

Date of Birth:

Participant Statement

- I have read the participant information sheet for this study and understand what is involved in taking part. Any questions I have about the study, or my participation in it, have been answered to my satisfaction.
- I understand that I do not have to take part and that I may decide to withdraw from the study at any point without giving a reason and this will have no effect on my medical care and legal rights.
- Any concerns I have raised regarding this study have been answered and I understand that any further concerns that arise during the time of the study will be addressed by the investigator. I therefore agree to participate in the study.

It has been made clear to me that, should I feel that my rights are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform the The University Secretary and Clerk to the Board of Governors, Manchester Metropolitan University, Ormond Building, Manchester, M15 6BX. Tel: 0161 247 3400 who will undertake to investigate my complaint.

Signed (Participant) Date

Signed (Investigator) Date

APPENDIX 2

PARTICIPANT INFORMATION SHEET AND CONSENT FORM FOR STUDY 2

MANCHESTER METROPOLITAN UNIVERSITY

Department of Exercise and Sport Science

MMU Cheshire

Crewe

CW1 5DU

Tel: 0161 247 5528

Participant Information Sheet

Does personality type influence attentional bias in individuals with low back pain?

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish.

> **Part 1** tells you the purpose of this study and what will happen to you if you take part.
>
> **Part 2** gives you more detailed information about the conduct of the study.

Ask us if there is anything that is not clear or if you would like more information. Please take time to decide whether or not you wish to take part.

Part 1

What is the purpose of the research?

The purpose of the study is to determine if characteristics of your personality, particularly the way in which you interpret and respond to anxiety, are associated with the way you look at and attend to different types of images.

Why have I been invited?

We have asked you to take part in this study because you are either attending a chronic back pain management programme or you are not suffering from any chronic pain condition and will form part of our control group.

Do I have to take part?

It is up to you to decide if you would like to join the study. We will describe the study and go through this information sheet with you. If you agree to take part, we will then ask you to sign a consent form. You are free to withdraw at any time, without giving a reason. This would not affect the standard of care you receive.

What will happen to me if I agree to take part?

If you agree to take part in the study you will be asked to attend two testing sessions with the researcher at Kingsgate House in addition to your prescribed programme. The first session will take approximately 30 minutes and the second session should take no more than one hour. The testing sessions will have no impact on your normal treatment and will have no impact on the care you receive.

Expenses and payments

As compensation for your time, we are offering participants who take part in both testing sessions a £10 high street shopping voucher. The voucher will be given to participants at the end of the second testing session.

What will I have to do?

The first session will take approximately 30 minutes and is to allow you to practice on a computer, the reaction time task that will be used in the main experimental session. On your first visit, you will also be asked to fill in three questionnaires about you personality (the Marlowe-Crowne Social Desirability Scale), how you feel about completing everyday tasks (the Tampa scale of Kinesiophobia), and about your anxiety (the State Trait Anxiety Inventory).

In the second session, you will be ask to sit in front of a TV screen and will be presented with a series of images showing activities, people, animals or nature scenes. Following each image you will be asked to respond as fast as possible, by pressing appropriate buttons on a computer keyboard to a stimulus that will appear on the screen. Trials will be presented to you in blocks and you can move around between each block to accommodate any discomfort you may experience while sitting. At the end of the session you will be asked to complete a short anxiety questionnaire similar to the one completed on the first visit. This session should take no more than two hours.

During the second trial, we will also monitor your eye movement to determine where you were looking during each trial. The equipment for monitoring eye movement will be mounted onto a set of glasses for you to wear. The glasses will not restrict the movement of your eyes or head and there will be no contact with your eye.

Are there any disadvantages or risks in taking part?

There are no disadvantages to taking part and participation will not interfere with or influence the quality or type of care you will receive for your back pain. Some of the images presented to you will show people performing movements and activities that are commonly associated with back pain, for example lifting or twisting movements. It is possible that looking at these images may cause you some anxiety or to attend more to your own symptoms. In the unlikely event you do experience any enhanced

anxiety or worry as a result of seeing the images, at the end of the session you will be able to discuss this with your physiotherapist who will be able to address this in your treatment programme. You can stop the experiment at any time and withdraw from the study.

What are the side effects of any treatment received when taking part?

There are no side effects of the testing session.

What are the possible benefits of taking part?

We cannot promise the study will help you but hope that the information we get from this study could one day help improve the treatment of people with chronic low back pain.

What happens when the research study stops?

Once you have attended the two testing sessions that is the end of your involvement in the research study. Your treatment programme will remain the same if you're involved in this study and will not change after the study has finished.

What if there is a problem?

Any complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. The detailed information on this is given in part 2.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. The details are included in Part 2. If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making any decision

Part 2

What will happen if I don't want to carry on with the study?

You are under no obligation to complete the study and are free to withdraw from the study at any time. If you withdraw from the study, we will destroy all your identifiable samples, but we will use the data collected up to your withdrawal.

What if there is a problem?

If you have a concern about any aspect of this study you should ask to speak to the researchers who will do their best to answer any questions (tel: 0161 247 5528). If you remain unhappy and wish to complain formally, then please contact the researchers university through the address provided below:

Registrar & Clerk to the Board of Governors

Head of Governance and Secretariat Team

Manchester Metropolitan University,

All Saints Building, All Saints,

Manchester, M15 6BH

Tel: 0161 247 1390.

I confirm that the insurance policies in place at Manchester Metropolitan University will cover claims for negligence arising from the conduct of the University's normal business, which includes research carried out by staff and by undergraduate and postgraduate students as part of their course. This does not extend to clinical negligence.

Will my taking part in this study be kept confidential?

If you join the study, all of the information collected will be kept confidential and used for the purposes of this study and any associated publications. The data will be stored in a coded format, participant names and codes will not be kept in the same location and the storage system will be password protected. Only the Chief Investigator and named members of the research team will have access to the data. The data will be kept for the duration of the study and for any necessary period associated with resulting publications.

If the results of the study are used in conferences or published in scientific journals at some point in the future, you will not be identified in any way. As a participant you have the right to obtain a copy of any publication resulting from the research.

Involvement of the General Practitioner.

There is no reason for us to inform your GP of your involvement in the study.

What will happen to any samples I give?

If you decide to take part in the study, all the data which is collected will be stored on a computer in a coded format and only accessed by the research team. Data will be kept in a coded format throughout the study and participant names and codes will not be kept in the same location. If you decide to withdraw from the study, you can request for all data to be removed from the study. If the data from this study is published in scientific journals or presented at conferences you will not be identified in any way.

Will any genetic tests be done?

There will be no genetics test involved in this study.

What will happen to the results of the research study?

Once the study has ended, we aim to publish and present the results from this study in scientific journals and conferences once the study has ended, you will not be identified in any way. As a participant you have the right to obtain a copy of any publication resulting from the research.

Who is organizing and funding the research?

The research has been funded by the Institute for Performance Research at Manchester Metropolitan University and is being undertaken as part of a postgraduate degree research project.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favorable opinion by Greater Manchester Central Research Ethics Committee.

Further information and contact details

If you would like general or specific information about the research project the Principal Investigator is Zoe Franklin. Please do not hesitate to email her on z.franklin@mmu.ac.uk or telephone on 0161 247 5528. If you are unhappy with the principal investigator or would like to make a complaint about the research then please contact the address below:

Registrar & Clerk to the Board of Governors

Head of Governance and Secretariat Team

Manchester Metropolitan University,

All Saints Building, All Saints,

Manchester, M15 6BH

Tel: 0161 247 1390.

The research Supervisors for this project are Prof Neil Fowler and Dr. Nickolas Smith from the Department of Exercise and Sport Science at MMU Cheshire (n.fowler@mmu.ac.uk/ n.c.smith@mmu.ac.uk).

Finally, a thank you!

Thank you very much for considering participating in this study. I hope that the information I have provided is in enough detail for you. If you have any questions please do not hesitate to ask.

Patient Identification Number for this trial:

Manchester Metropolitan University

CONSENT FORM

Title of Project: Does personality type influence attentional bias in individuals with low back pain?

Name of Researcher: Zoe Franklin

Please initial all boxes

1. I confirm that I have read and understand the information sheet dated 20th May (version 2.0) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐

3. I agree to take part in the above study. ☐

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature

.

APPENDIX 3
QUESTIONNAIRE BOOKLET

Participant No:

The role of coping styles in the management of chronic pain

Chief investigator: Zoe Franklin, MSc
Director of Studies: Prof Neil Fowler

Dear participant,

Thank you for agreeing to participate in this study. Enclosed you will find a pack containing a number of questions about different aspects of your personality and pain. Please can you complete these and return to me in the reply paid envelope provided. You can complete the questionnaire whenever and wherever is convenient to you.

Please read each item carefully but try not to spend too much time on any one statement as we are interested in your first response to the question. There are no right or wrong answers, please select the box which is the best fit for you. There are instructions at the top of each page, which will help you to answer the questions.

In order to preserve your anonymity, your questionnaire has been assigned a number (see above). Your responses to the questionnaire will not be connected in any way to your identity or any personal information provided in your consent form.

Many thanks for taking the time to complete this questionnaire. If you have any questions please contact me either by email (z.franklin@mmu.ac.uk) or telephone 0161 247 5528.

Zoë Franklin.

Zoë Franklin

Personal Characteristics

Today's date: ……..

Approximately, how long have you had your pain?
……

Employment situation:	☐ Currently working / studying ☐ Unemployed – not due to health issues ☐ Unemployed – due to health issues ☐ Housewife / House husband ☐ Retired not due to health reasons ☐ Retired due to health reasons

How would you rate your satisfaction with the most recent treatment you have received on a scale of 0 to 10, where 0 is *'not satisfied at all'* and 10 is *'very satisfied'*

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

How would you rate your pain on a scale of 0 to 10 in the **past 24 hours**, where 0 is '*no pain'* and 10 is '*pain as bad as could be*'?

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
No Pain										Pain as bad as could be

Three month satisfaction and pain intensity questions

How would you rate your satisfaction with the treatment you have received over the last three months on a scale of 0 to 10, where 0 is *'not satisfied at all'* and 10 is *'very satisfied'*

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

Reflecting on the treatment you have received over the past 3 months how satisfied are you with the improvement in your ability to cope with pain on a scale of 0 to 10, where 0 is 'not satisfied at all' and 10 is 'very satisfied'

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

How satisfied are you with your current level of pain on a scale of 0 to 10, where 0 is 'not satisfied at all' and 10 is 'very satisfied'

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

How would you rate your pain on a scale of 0 to 10 in the **past 24 hours**, where 0 is '*no pain'* and 10 is '*pain as bad as could be*'?

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
No Pain										Pain as bad as could be

Six and twelve month satisfaction and pain intensity questions

How would you rate your satisfaction with the treatment you have received over the last three months on a scale of 0 to 10, where 0 is *'not satisfied at all'* and 10 is *'very satisfied'*

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

Reflecting on the treatment you have received over the past 3 months how satisfied are you with the improvement in your ability to cope with pain on a scale of 0 to 10, where 0 is 'not satisfied at all' and 10 is 'very satisfied'

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

How satisfied are you with your current level of pain on a scale of 0 to 10, where 0 is 'not satisfied at all' and 10 is 'very satisfied'

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Not satisfied at all										Very satisfied

How would you rate your pain on a scale of 0 to 10 in the past 24 hours, where 0 is 'no pain' and 10 is 'pain as bad as could be'?

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
No Pain										Pain as bad as could be

Treatment Characteristics

The next questions ask about appointments offered to you concerning the management of your pain.

I remind you that your responses are confidential and for research purposes only, they will not be shared with your care team or influence your future care in any way.

1) Over the past 6 months approximately how many sessions of treatment / appointments have you been offered?

☐ None ☐ 1-3 ☐ 4-6 ☐ 7-9 ☐ 10+

2) Of those sessions offered to you, approximately what proportion did you attend?

☐ All ☐ Most (more than half) ☐ about half ☐ some (less than half) ☐ None

3) If you missed any of the sessions offered to you would you state / describe the reason?

……
……
……
……
……
…….

Marlowe-Crowne Social Desirability Scale (Strahan and Gerbasi, 1972).

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false **as it relates to you personally**.

	True	False
I never hesitate to go out of my way to help someone in trouble	☐	☐
I have never intensely disliked anyone	☐	☐
There have been times when I was quite jealous of the good fortune of others	☐	☐
I would never think of letting someone else be punished for my wrong doings	☐	☐
I sometimes feel resentful when I don't get my way	☐	☐
There have been times when I felt like rebelling against people in authority even though I knew they were right	☐	☐
I am always courteous, even to people who are disagreeable	☐	☐
When I don't know something I don't at all mind admitting it	☐	☐
I can remember "playing sick" to get out of something	☐	☐
I am sometimes irritated by people who ask favours of me	☐	☐

Trait subscale of the State-Trait Anxiety Inventory (Spielberger et al., 1983).

A number of statements which people have used to describe themselves are given below. Read each statement and then mark the appropriate box to indicate **how you generally feel**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe **how you generally feel**.

	Not at all	Somewhat	Moderately so	Very much so
I feel pleasant	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel nervous and restless	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel satisfied with myself	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I wish I could be as happy as others seem to be	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel like a failure	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel rested	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I am calm, cool and collected	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel that difficulties are piling up so that I cannot overcome them	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I worry too much over something that doesn't really matter	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I am happy	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I have disturbing thoughts	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I lack self confidence	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel secure	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I make decisions easily	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I feel inadequate	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I am confident	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
Some unimportant thoughts run through my mind and bother me	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I take disappointments so keenly that I can't put them out of my mind	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I am a steady person	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐
I get in a state of tension or turmoil as I think over my recent concerns and interests	Not at all ☐	Somewhat ☐	Moderately so ☐	Very much so ☐

The Roland Morris Disability Questionnaire (Roland and Morris, 1983).

When you have chronic pain you may find it difficult to do some things. This list contains sentences that people use to describe themselves when they are in pain. As you read the list, think of yourself **today** and mark ***true*** or ***false***, whichever describes you **TODAY**.

1	I stay at home most of the time because of my pain.	True ☐	False ☐
2	I change position frequently to try and get myself comfortable.	True ☐	False ☐
3	I walk more slowly than usual because of my pain.	True ☐	False ☐
4	Because of my pain, I am not doing any of the jobs that I usually do around the house.	True ☐	False ☐
5	Because of my pain, I use a handrail to get upstairs.	True ☐	False ☐
6	Because of my pain, I lie down to rest more often.	True ☐	False ☐
7	Because of my pain, I have to hold on to something to get out of an easy chair.	True ☐	False ☐
8	Because of my pain, I try to get other people to do things for me.	True ☐	False ☐
9	I get dressed more slowly than usual because of my pain.	True ☐	False ☐
10	I only stand up for short periods of time because of my pain.	True ☐	False ☐
11	Because of my pain, I try not to bend or kneel down.	True ☐	False ☐
12	I find it difficult to get out of a chair because of my pain.	True ☐	False ☐
13	I am in pain almost all of the time.	True ☐	False ☐
14	I find it difficult to turn over in bed because of my pain.	True ☐	False ☐
15	My appetite is not very good because of my pain.	True ☐	False ☐
16	I have trouble putting on my socks / tights because of the pain.	True ☐	False ☐
17	I only walk short distances because of my pain.	True ☐	False ☐
18	I sleep less well because of my pain.	True ☐	False ☐
19	Because of my pain, I get dressed with help from someone else.	True ☐	False ☐
20	I sit down for most of the day because of my pain.	True ☐	False ☐
21	I avoid heavy jobs around the house because of my pain.	True ☐	False ☐
22	Because of my pain I am more irritable than usual.	True ☐	False ☐
23	Because of my pain I go upstairs more slowly.	True ☐	False ☐
24	I stay in bed most of the time because of my pain.	True ☐	False ☐

The Pain Catastrophising Scale (Sullivan et al., 1995).

We are interested in the types of thoughts and feelings you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain.

Please mark **the degree to which you have these thoughts and feelings when you are experiencing pain.**

		Not at all	To a slight degree	Sometimes	To a great degree	All the time
1	I worry all the time about whether the pain will end	☐	☐	☐	☐	☐
2	I feel I can't go on	☐	☐	☐	☐	☐
3	It's terrible and I think it's never going to get any better	☐	☐	☐	☐	☐
4	It's awful and I feel that it overwhelms me	☐	☐	☐	☐	☐
5	I feel I can't stand it anymore	☐	☐	☐	☐	☐
6	I become afraid that the pain may get worse	☐	☐	☐	☐	☐
7	I think of other painful experiences	☐	☐	☐	☐	☐
8	I anxiously want the pain to go away	☐	☐	☐	☐	☐
9	I can't seem to keep it out of my mind	☐	☐	☐	☐	☐
10	I keep thinking about how much it hurts	☐	☐	☐	☐	☐
11	I keep thinking about how badly I want the pain to stop	☐	☐	☐	☐	☐
12	There is nothing I can do to reduce the intensity of the pain	☐	☐	☐	☐	☐
13	I wonder if something serious may happen	☐	☐	☐	☐	☐

The Centre for Epidemiologic Studies Depression Scale (Radloff, 1977).

Below is a list of the ways you might have felt or behaved. Please cross the box that describes **how often** you have felt this way **during the past week.**

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that don't usually bother me.	☐	☐	☐	☐
2. I did not feel like eating: my appetite was poor.	☐	☐	☐	☐
3. I felt that I could not shake off the blues even with help from my family or friends.	☐	☐	☐	☐
4. I felt I was just as good as other people.	☐	☐	☐	☐
5. I had trouble keeping my mind on what I was doing.	☐	☐	☐	☐
6. I felt depressed.	☐	☐	☐	☐
7. I felt that everything I did was an effort.	☐	☐	☐	☐
8. I felt hopeful about the future.	☐	☐	☐	☐
9. I thought my life had been a failure.	☐	☐	☐	☐
10. I felt fearful.	☐	☐	☐	☐
11. My sleep was restless.	☐	☐	☐	☐
12. I was happy.	☐	☐	☐	☐
13. I talked less than usual.	☐	☐	☐	☐
14. I felt lonely.	☐	☐	☐	☐
15. People were unfriendly.	☐	☐	☐	☐
16. I enjoyed life.	☐	☐	☐	☐
17. I had crying spells.	☐	☐	☐	☐
18. I felt sad.	☐	☐	☐	☐
19. I felt that people dislike me.	☐	☐	☐	☐
20. I could not get "going."	☐	☐	☐	☐

The Chronic Pain Self-efficacy Scale (Anderson et al., 1995).

We would like to know how confident you are in performing certain daily activities. For each of the following questions, please put a cross in the box that reflects how confident you are that you can perform the task **as of now** without help from another person. Please note that **we are not** assessing whether you actually engage in the specific activity, we are just interested in the **confidence** you have in your ability to perform the activity.

AS OF NOW, HOW CONFIDENT ARE YOU THAT YOU CAN

Totally Unconfident — Moderately Confident — Totally Confident

	0	1	2	3	4	5	6	7	8
1. Walk ½ mile on flat ground	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Lift a 10lb box?	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Perform a daily home exercise programme?	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Perform your household chores	☐	☐	☐	☐	☐	☐	☐	☐	☐
5. Shop for groceries or clothes?	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Engage in social activities	☐	☐	☐	☐	☐	☐	☐	☐	☐
7. Engage in hobbies or recreational activities?	☐	☐	☐	☐	☐	☐	☐	☐	☐
8. Engage in family activities?	☐	☐	☐	☐	☐	☐	☐	☐	☐
9. Perform the work duties you had prior to the onset of chronic pain?	☐	☐	☐	☐	☐	☐	☐	☐	☐

The Tampa Scale of Kinesiophobia (Miller et al., 1991).

This is a list of phrases which other patients have used to express how they view their condition. Please indicate the extent to which you **agree** with each statement.

		Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	I'm afraid that I might injure myself if I exercise.	☐	☐	☐	☐
2	If I were to try and overcome it, my pain would increase.	☐	☐	☐	☐
3	My body is telling me I have something dangerously wrong.	☐	☐	☐	☐
4	People aren't taking my medical condition seriously enough.	☐	☐	☐	☐
5	My pain has put my body at risk for the rest of my life.	☐	☐	☐	☐
6	Pain always means I have injured my body.	☐	☐	☐	☐
7	Simply being careful that I do not make unnecessary movements is the safest thing I can do to prevent my pain from worsening.	☐	☐	☐	☐
8	I wouldn't have this much pain if there wasn't something potentially dangerous going on in my body.	☐	☐	☐	☐
9	Pain lets me know when to stop exercising so that I don't injure myself.	☐	☐	☐	☐
10	I can't do all the things normal people do because it's too easy for me to get injured.	☐	☐	☐	☐
11	No one should have to exercise when he/she is in pain.	☐	☐	☐	☐

End of questions.

Thank you for taking the time to answer these questions.

APPENDIX 4
INTERVIEW GUIDE

Semi-structured interview guide

Introductory:

1) To begin, could you give, me a bit more detail about your pain. Specifically, where are you experiencing your pain and when the problem first started?
2) What type of treatment have you been attending?
   Probe- Is this the first type of treatment you have sought for you pain?

Treatment:

1) Is there anything you expected to be involved with the treatment experience?
   Probe- What led you to these expectations?
2) Over the course of treatment, did your expectations change?
3) In what ways did your expectations change?
4) Are you satisfied with the level of contact with the clinicians?
5) What type of treatment have you found most useful in improving your control of your pain?
6) Have you been given strategies to help you cope with your pain?
7) For you, what is the most important outcome from treatment?

Thinking now about your interactions with the clinicians:

1) How well did you feel your condition was explained to you?
   Probe: Did the explanation help you to understand your condition and cope with it?
2) What type of communication did you find most effective?
3) To what extent do you feel you are involved in planning your treatment?
4) How do you feel about the approach taken to managing your pain?

Thinking now about the activities you undertake in Daily life:

1) How did the course of treatment affect your chronic pain symptoms and the impact it had on everyday life?
2) Has your daily life changed since your chronic condition started?
3) In what ways does your post-treatment levels of pain affect your ability to complete activities in daily life?

APPENDIX 5
IAPS IMAGE NUMBERS

IAPS neutral images:

1122, 1333, 1350, 1390, 1419, 1450, 1505, 1616, 1645, 1675, 1903, 1908, 1935, 2032, 2038, 2309, 2377, 2446, 2487, 2514, 2518, 2521, 2575, 2580, 2840, 2880, 2980, 3005, 5390, 5395, 5455, 5471, 5500, 5510, 5520, 5531, 5532, 5533, 5535, 5661, 5731, 5740, 5900, 5940, 5950, 6150, 6570.2, 6900, 7000, 7001, 7002, 7003, 7004, 7006, 7009, 7010, 7011, 7012, 7013, 7014, 7016, 7017, 7018, 7019, 7020, 7021, 7025, 7026, 7030, 7031, 7032, 7033, 7034, 7035, 7036, 7037, 7038, 7039, 7040, 7041, 7042, 7043, 7044, 7045, 7046, 7050, 7052, 7053, 7054, 7055, 7056, 7057, 7058, 7059, 7060, 7061, 7062, 7077, 7080, 7081, 7090, 7092, 7095, 7096, 7100, 7130, 7140, 7150, 7160, 7161, 7170, 7175, 7179, 7180, 7182, 7184, 7185, 7187, 7207, 7211, 7217, 7233, 7235, 7236, 7242, 7247, 7255, 7509, 7547, 7590, 7632, 7640, 7700, 7705, 7710, 7820, 7830, 7950, 8211, 8325, 9210, 9360, 9422, 9469.

IAPS positive images:

1410, 1440, 1441, 1460, 1463, 1500, 1510, 1540, 1590, 1600, 1603, 1604, 1610, 1620, 1630, 1710, 1721, 1722, 1731, 1740, 1750, 1999, 2045, 2058, 2070, 2071, 2260, 5000, 5001, 5010, 5199, 5200, 5201, 5202, 5210, 5220, 5260, 5270, 5300, 5450, 5460, 5470, 5480, 5551, 5594, 5600, 5611, 5623, 5629, 5631, 5660, 5700, 5711, 5725, 5750, 5760, 5764, 5779, 5780, 5781, 5811, 5814, 5820, 5825, 5829, 5830, 5831, 5833, 5836, 5890, 5891, 5910, 5982, 7200, 7220, 7230, 7260, 7270, 7280, 7325, 7330, 7350, 7400, 7405, 7430, 7470, 7480, 7492, 7502, 7545, 7580, 8162, 8163, 8170, 8190, 8501, 8502, 8503, 8510, 8531.

APPENDIX 6
PUBLICATIONS